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By

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MOTIVATIONS, SPECIALIZATIONS, IDENTITIES, AND CONSTRAINTS ASSOCIATED WITH HUNTING IN NEBRASKA

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This research herein examines the statewide motivations, specializations, identities, and constraints of Nebraska resident hunters. An online survey was conducted in the fall of 2017 asking respondents about their motivations, skills, demographics, and constraints to personal hunting experiences to determine what factors affect hunters. We used factor analysis to examine the effect of motivations, specializations, and constraints to see which factors influence participation. By understanding multiple attributes of our hunters, we gain further insight into participation trends and recreationists needs and expectations. Results suggested that our biggest constraint to overcome is land access, while most people are motivated to hunt for the social relations involved with hunting. The study results provided information on factors associated with hunting participation and future implications of recruitment and retention.

Further, a second, more specific, survey was conducted, focusing on a grouse tournament hunt in the sandhills region of Nebraska. A paper survey was handed out to tournament hunters at the competition, in which questions revolved around motivations and hunter characteristics. Tournaments hunters were not motivated to fill their bag limit and win the competition, but instead were participating for the comradery amongst friends. Additionally, grouse tournament hunters had a significant amount of hunting experience and the majority of participants were from out-of-state.

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Chapter 1: General Introduction

Within the last couple of decades, there has been growing concern about the decline in participation in hunting activities throughout the United States (Adams et al. 2004, Ryan and Shaw 2011). These declines are not only occurring throughout many states, but also across multiple types of hunting (e.g. waterfowl, upland, small game). With hunting once being an important tradition and staple for families, it begs the question "what has changed?" Several large societal changes have occurred during this time frame. Groceries have become readily available and can be delivered to a residency (i.e., Amazon Marketplace, Walmart, HelloFresh). Research points to societal changes and personal demands, such as time and money, as to why people have begun hunting less and less over the years. Even school and sports compete for a youth's time (Brown et al. 2000). Further, the access to media has increased during the last decade, where an 8-10-year old now spends an average of 8.5 hours per day on media (e.g. television, computer, iPad), and older teenagers spending >11 hours per day on media (Strasburger et al. 2013). Did people in the past just rely on wildlife more? Is the interest deteriorating and why? With less and less people participation in hunting, we lose mentors for future generations to learn from, and therefore, perpetuating the downward spiral in hunting participation.

In addition to shifts in the culture of the United States, several factors have been suggested as potential hindrances (i.e., constraints) to hunting participation. Gaining access to land either uncrowded public land hunters or privately-owned land may be

viewed as difficult. Motivations, such as to get outdoors, may be fulfilled by another recreational activity other than hunting. Furthermore, every activity comes with a cost. The price of equipment, gas, and lodging to participate in hunting, with no guarantee at success, may be a driving force behind the decline. The abundance and type of game has also been speculated as a reason, but the relative abundance of many game species is steady or increasing, providing plenty of opportunity for hunters to harvest (Vrtiska et al. 2013).

To properly understand potential mechanisms behind the decline in hunters, it is important to look at current and past hunters to understand their experiences and underlying motivations to hunt. Understanding internal (e.g. the role of identity) and external (e.g. constraints inhibiting participation) factors is crucial in order to fathom why people have decreased their participation. Collecting information from hunters about their preferences, motivations, specializations, and constraints, which will better inform the state agencies of who our hunters have been and who they may be in the future.

Need for Study:

Hunting permits in the United States have declined by nearly 2 million individuals between 1982-2010 (Winkler and Warnke 2013). Additionally, the participation rate of those who engaged in hunting has dropped from 7.2% in 1980 to 4.7% in 2010 (Winkler and Warnke 2013). For those that continue to participate in hunting there has been a shift in motivations for hunting, from primarily sustenance to largely leisure, where seeing animals and being outdoors is an important reason for participation and not just harvesting game for food (Schroeder et al. 2006).

Declines in hunting participation presents a problem for wildlife managers since hunting is a critical component to the conservation system within the United States (Organ et al. 2012). Decreased permit sales reduces wildlife agencies' revenues that fund operation costs (Fix et al. 1998). Revenues for conservation programs, generated through permit sales and excise taxes from the Pittman Robertson Act, are directly tied to hunting participation and firearm sales and any decrease will result in a loss of funds for conservation, research, hunter education, and habitat management (Winkler and Warnke 2013). A decrease in revenue can interfere with the agency's ability to properly manage game species and give recreationists better hunting opportunities. A decrease in the number of hunters also weakens public support for hunting (Mehmood et al. 2003), which is required to maintain and protect public lands open for hunting. With 61% of land in the United States (97% in Nebraska; Bishop et al. 2011) privately owned; tracts of land owned by hunters or are hunter friendly are crucial for conservation and providing opportunities for hunters (Winkler and Warnke 2013). Therefore, an understanding of what participants want and expect in their outdoor experience is required, creating a crucial need for the examination of motivations, constraints, and identities of hunters. Herein, we investigate motivations, specializations, constraints, and hunting identities of Nebraska residents to better understand our resident sportsperson population.

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Chapter 2: Constraints and Preferences to Hunting in Nebraska

Introduction

Despite a history and culture rooted deeply in hunting, decreases in hunting license sales and participation have been observed throughout the United States (Winkler and Warnke 2013). The social, physiological, and economic benefits derived from hunting may be lost if participation continues to fall (Barro and Manfredo 1996). Declines in sales directly impact wildlife management agency's operating budget, limiting habitat improvement, game stocking, and other conservation efforts. Whereas the cost of reduced license sales may be offset by grants and other funding opportunities, the loss of public support for hunting and wildlife management agencies creates additional issues (Mehmood et al. 2003).

It has been hypothesized that hunting participation is tied to the population of game species (Vrtiska et al. 2013). During times of low game abundance, harvest success is low and, as a result, participation may drop off (Schmidt and Gilbert 1981). During times of abundant game abundance, harvest success is greater and may bring in lapsed or new hunters. However, there has been a decline in the number of hunters even with relatively abundant game and liberal harvest regulations (Riley et al. 2003, Vrtiska et al. 2013, Massei et al. 2015). The disconnect between hunter numbers and game abundance has been observed among several game species internationally (white tail deer [Riley et al. 2003]; wild boar [Massei et al. 2015]; geese [Ankney 1996]). In Nebraska, there has been a dissociation observed among grouse populations Sharptail Grouse (*Tympanuchus phasianellus*) and Prairie Chicken (*Tympanuchus cupido*) and hunters seeking grouse (J. Lusk, personal communication 2016). If the abundance of game

populations was one of the strongest factors driving the number of hunters, we would expect to see more hunters pursuing grouse. Conversely, deer hunting participation has held steady or slightly increased with a relatively abundant deer population in Nebraska. Multiple processes are likely contributing to the decrease in overall hunting participation, such as shifts in the preference of the species sought, changes in traditions, changes in hunter identity, or changes in the reasons why hunters participate in the sport (Schulz et al. 2003). Further, there may be other factors, physical or emotional, that may limit one's ability to pursue hunting as a recreation activity (Barro and Manfredo 1996, Miller and Vaske 2003).

People that participate in hunting and fishing are not a homogenous group (Arlinghaus et al. 2008, Beardmore et al. 2015); suggesting that there are differences among preferences, motivations (i.e., factors that influence the participation in an activity), and constraints (i.e., a circumstance or obstacle that prevents or inhibit participation) that vary within the hunting population based on types of hunter, time, and geographic location. To better understand the decline in hunter participation, an increased understanding of the constraints to hunt and harvest are an important focus of human dimensions research. Constraints limit the formation of recreational preferences and inhibit participation (Metcalf et al. 2015). Examining hunter participation, motivations, and constraints will provide wildlife managers insight to where more effective resources may be needed for recruitment, retention, and reactivation of sportspersons (Larson et al. 2014). Recruitment is defined as the number of people entering the hunting system. Retention is the number of people remaining in the hunting population overtime (Ryan

and Shaw 2011). Finally, we define reactivation as those individuals who stopped hunting for a given period of time, but then start hunting again.

There were two primary objectives for this study. One, identify differences in preferences and motivations between hunters in Nebraska to distinguish any possible groups of similar interests. This goal is loosely based on Fishbein and Ajzen's (1975) model of reasoned action, which, relates to behavior, the precursor to a person's intention to perform an activity. We allowed respondents to choose their reasons for participating in hunting. Our model for motivations focused on scenery, social, and hunting aspects, while our preferences targeted the seven most commonly hunted species in Nebraska. We hope to use these results to gain a better understanding of the complexity involved in the decisions to hunt. Second, was to identify the constraints to hunting in Nebraska to understand hunter's needs to better inform recruitment, retention, and reactivation (R3) efforts. We examined constraints that focused on the following categories: skills, costs, time, and access. Depending on the type and extent of the constraint, people may choose to participate less frequently, affecting their level of participation and satisfaction (Barro and Manfredo 1996). We hope to use this information to pin-point areas of the hunting experience that can be improved.

Methods

Survey

For this study, our study group consisted of individuals who purchased a small-game (i.e., small game or hunt fish combination) permit or a big-game (i.e. deer or turkey) permit at least once in Nebraska between 2010 and 2016. Individuals could have purchased any combination of the above permit types to be included in the sampling

frame. Individuals must have been at least 19 years old at time of license purchase, a Nebraska resident, and had an email address on file. To estimate the number of individuals we would send a survey invitation, we assumed a 20% response rate (based on experience with previous email surveys) with an error margin of 4% and a confidence interval of 95%. We drew a random sample of 7,000 individuals. Respondents were sent an email invitation (Appendix A) to an online survey (Appendix B) created through SNAP Survey Software (Mercator Research Group 2003). The survey link was active for one month, with an email reminder (Appendix C) sent each week to individuals who had not responded. All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20170717194 EX).

To compare demographics between the respondents of the survey and the non-respondents, we evaluated relative non-response bias in gender, residency, and average age of respondents using methods described in (Callegaro et al. 2015). Briefly, non-response bias is the difference between the expected value estimate based on respondents and the true value for population characteristics (e.g., gender, residency, and average age) on interest. Relative non-response bias is the proportion of the population characteristic of interest that the bias represents (Callegaro et al. 2015). Relative non-response bias is calculated by calculating the difference in mean of the value of interest from respondents and from non-respondents. The difference is multiplied by proportion of non-respondents relative to respondents and then the value of interest is divided by the mean of the entire sample population. Standard relative non-response benchmarks are between 5% and 10% (Callegaro et al. 2015).

Best worst scaling

Respondents were asked about species preferences using a best-worst scaling (BWS) method (Louviere et al. 2015). The BWS method is useful for creating concrete and more discriminating findings compared to ranking methods because of the trade-off opportunities in respondents' responses (Lee et al. 2007). Therefore, BWS-scored data have minimal response style bias (Bolt and Johnson 2009), values are measured on a common scale, and provide relatively simple interpretation of the measurement scale (Marley and Louviere 2005). The difference in best-worst scores (i.e., the number of times an item is considered ''best'' and subtracting the number of times it is considered ''worst'') is a close approximation of the true scale values (Auger et al. 2007). To minimize the burden on the respondents from asking all possible combinations (i.e., a full factorial design), we used a balanced incomplete block design (BIBD) to assess the preferences of seven Nebraska species. The major benefit of using a BIBD design is that it is capability of greatly decreasing the number of choice sets to be evaluated, while maintaining the balanced occurrence and co-occurrence of items across the question sets with the number of items that appear in each set ideally must be fixed at three or more (Raghavarao and Padgett 2014). Following the BIBD approach, each respondent was given seven choice sets of four different species combinations (Appendix B). From each question set, the respondent could choose only one least preferred and one most preferred species in the set (Figure 2-1). The species used in the choice sets were: pheasant (*Phasianus colchicus*), waterfowl (duck, goose), deer (mule, whitetail) (*Odocoileus* spp.), quail (*Colinus virginianus*), rabbit (*Sylvilagus* spp.) or squirrel *(Sciuridae* spp.), grouse (sharptail *Tympanuchus phasianellus*, prairie chicken *T. cupido*), and turkey (*Meleagris*

gallopavo). These species were chosen as these are the prominent game hunted in Nebraska and do not fall into a lottery system for permits. In each choice set, the order of the species was randomized for each respondent. The choice sets and species in each set was determined using the crossdes (Sailer 2013) and the support.BWS package (Aizaki 2018) in R (R Core Team 2018).

For each respondent, we calculated our Best Worst (BW) score for each of the species by subtracting the number of times a species was selected as ‘‘least important’’ from the number of times that same species was selected as ‘‘most important’’ using the support.BWS package in R. Each of the species appeared in four sets, so that the individual-level scales for each ranged from -4 to +4. We then used Ward's D2 hierarchical cluster method (Murtagh and Legendre 2014) to classify respondents based on the simple BW scores (Auger et al. 2007). The appropriate number of clusters was found using the NbClust package (Charrad et al. 2014). After individuals were assigned to a cluster, we then calculated the standardized BW score (i.e., square root of the best count divided by the worst count scoring procedure) (Aizaki et al. 2014) for each cluster group to illustrate differences in species preferences.

Motivations

We sought to evaluate hunting-related motivations between small game and big game hunters, but also included some of the more salient non-hunting-related motivation dimensions: socializing, enjoying nature, and enjoying solitude (Decker and Connelly 1990, Hayslette et al. 2001). Seven hunt-related items were used to represent two distinct subdimensions within hunting motivations: challenge factors (e.g., harvest a trophy, fill bag or tag) and consumption factors (i.e., providing meat for me, family or friends). Each

motivation question asked the respondent to identify the importance of the item on a five-point scale from not at all important (scaled to 1) to very important (scaled to 5).

Constraint questions were asked on a five-point scale with ratings being: not all limiting (scaled to 1), slightly limiting, moderately limiting, limiting, and very limiting (scaled to 5). Constraint questions were based on multiple factors regarding opportunity, skills and interest, and commitments and costs (Appendix B). We also asked respondents about the taste of game (deer, grouse, pheasant, quail, rabbit, turkey, and waterfowl) and how difficult participants felt that it would be to hunt deer, grouse, pheasant, quail, rabbit, turkey, and waterfowl in Nebraska, if they had never attempted hunting that game before. These two questions were on a 5-point scale from "strongly dislike" (scaled to 1) to "strongly like" (scaled to 5) and "very difficult" (scaled to 1) to "very easy" (scaled to 5), respectively. For the taste questions respondents could have also responded as "Never tried".

Analysis

We examined the underlying structure of the constraint scale with exploratory factor analysis using the psych package (Revelle 2018) in R. An exploration factor analysis approach was necessary because a constraint scale in hunting has not been previously assessed. We first identified the appropriate number of factors using the "parallel" method using principal axis factor analysis with weighted least squares to find the minimum residual solution. Once we found the appropriate number of factors, we fit the constraint model using factor analysis with oblique rotation to group the 15 items (question responses) into constraint domains. For factors with eigenvalues greater than 1.0 and factor loadings greater than |0.4|, a reliability analysis using the Cronbach's alpha

criterion was used (Nunnally and Bernstein 1994). Items were combined into factors if reliability was greater than 0.6 (Nunnally and Bernstein 1994) and the mean values from the items within a factor provided indices of constraint importance for each factor.

We compared hunter preference group motivations and perceptions of constraints (global average based on the factor dimensions) using independent sample t-tests (Vaske 2008). While p-values indicate that groups are different, it does not provide information on how large differences are between groups (Durlak 2009). As such, we reported measures of effect size for Cohen's d for t-tests using the package effsize (Torchiano 2017) in R. Effect sizes for Cohen's d are 0.1 or less for negligible, 0.2 for small effects, 0.5 for medium effects, and 0.8 for large effects (Cohen 1988). We assessed differences between categories among species preference clusters using a $\chi 2$ test and Cohen's V for effect size. Effect sizes for Cohen's V are < 0.1 for negligible, 0.1 for small effects, 0.3 for medium effects, and 0.5 for large effects (Cohen 1988). Cohen's V was calculated using the vcd package (Meyer et al. 2017). All analyses were conducted using R.

Results

Survey Response

A total of 7,000 surveys were sent to individuals. Out of 7,000 surveys, 833 emails bounced and were not received by individuals; therefore, this left us with a grand total of 6,167 successfully emailed survey invitations. Of the revised total (n = 6,167), we had 1,327 individuals respond and complete the survey, which was an overall response rate of 21.5%. The average age of small game hunter respondents (47 years) was greater than the average of non-respondents (44 years) and the sample population (45 years, 6% relative non-response bias). The average age of big game hunter respondents (45 years) was

greater than the average of non-respondents (43 years) and the sample population (43 years, 4% relative non-response bias). A smaller proportion of small game female hunters (5%) responded to the survey than were present in either the non-respondent group (7%) or the sample population (6%, 20% relative non-response bias). A smaller proportion of big game female hunters (10%) responded to the survey than were present in either the non-respondent group (13%) or the sample population (12%, 17% relative non-response bias).

Species Preferences

The most appropriate number of clusters among species groups was two. There were 850 (76%) respondents that belonged to cluster 1 and 265 respondents (24%) that belonged to cluster 2. Cluster 1 was indicated by a strong preference for deer and less so by pheasant and turkey (standardized BW scale; Figure 2-1). Cluster 2 was indicated by a strong preference for pheasant and less so by quail. Species such as grouse, rabbit, and waterfowl were not preferred by either group, with rabbit consistently the least preferred. We will now refer to these two clusters as upland game preference and deer preference groups.

Hunters that preferred upland game were older (mean ± SD; 52.3 ± 13.0) than hunters that preferred deer (46.4 ± 13.0) ($t = 6.15$, $df = 393.54$, $P < 0.001$, Cohen's $d = -0.453$). There were relatively fewer females among hunters that preferred upland game (1.7%) than the deer preference hunters (8.9%) ($\chi^2 = 13.16$, $df = 1$, $P = 0.002$, Cramer's $V = 0.117$). In addition, there were relatively fewer upland game preference hunters that had hunted in the previous two years (88%) than those hunters that preferred deer hunting

(94%) (χ^2 = 10.81, df = 1, P = 0.001, Cramer's V = 0.105). There was a significant difference between the types of land hunted between the two preference groups (χ2 = 24.96, df = 3, p = <0.001, Cramer's V = 0.154). Upland game preference hunters primarily hunted on both private and public land (43%), followed by private land where permission is required (28%), followed by then by private land that was owned or leased (17%), and lastly by public land open to hunting (12%). Deer preference hunters primarily hunted on private land where permission is required (42%), followed by both private and public land (29%), then by private land that was owned or leased (21%), and lastly by public land open to hunting (8%).

There were some differences between the perceptions of taste of game between upland game preference and deer preferences hunters (Figure 2-2). Most hunters rated deer, pheasant, and turkey as "strongly like", however grouse, rabbit and waterfowl were the most not tried or the most disliked among the game assessed. Upland game and deer hunters perceived the difficulty hunting species similarly (Figure 2-3). Grouse were rated as the most difficult species to hunt, followed by other upland game and waterfowl. Rabbit was considered the easiest to hunt.

Motivations

Of the nine questions eliciting motivations for hunting among both preference groups, the greatest mean responses were "Spending time outdoors/experiencing nature" and "Spending time with family or friends" (Table 2-1). Of these highly rated motivations, there was no statistical difference between the species preference groups. Among those motivations that specifically targeted aspects of the hunt, there were some notable differences between those that preferred upland game versus those that preferred

deer. Harvesting a trophy was rated relatively low (mean = 1.99) by upland game hunters whereas, deer hunters rated it higher (mean = 2.68) (Table 2-1). Additionally, providing meat for myself, family or friends was rated much higher for the deer preference group (mean =3.65) than those from the upland game preference group (mean = 2.74). Deer preference hunters (mean = 3.62) also rated managing game populations greater than those from the upland game hunting preference hunters (mean = 3.13) (Table 2-1). A few other smaller differences between the hunter preference groups include: "Enjoying the solitude" and "Hunting for the challenge" were rated greater for the deer preference hunters than the upland game hunters (Table 2-1).

Constraints

Our initial factor analysis revealed six factors for our hunting constraints in Nebraska. However, three constraints (personal health, terrain hunted, and other personal commitments) were not well discriminated across factors. We dropped those three constraints and found that a five-factor solution was the best solution (Table 2-2). Factor 1 (Cronbach's $\alpha = 0.78$) represented constraints associated with cost and explained 25% of the variation. Factor 2 (Cronbach's $\alpha = 0.77$) represented constraints associated with access and explained 24% of the variation. Factor 3 (Cronbach's $\alpha = 0.68$) represented finding hunting partners, hunting skill, competing recreational activities, and eating game and explained 20% of the variation. Factor 4 (Cronbach's $\alpha = 0.83$) represented perceptions of the finding game and the state of the game populations and explained 20% of the variation. Factor 5 (Cronbach's $\alpha = 0.57$) represented constraints associated with rules and regulations and explained 12% of the variation. Overall the model fit reasonably well ($\chi 2 = 103.58$; Tucker Lewis Index = 0.967; RMSEA = 0.036).

Access type constraints were rated the greatest and activity related constraints the least by the upland game hunters and deer preference hunters (Table 2-3). While rated the greatest constraint, there was no statistical difference between the hunter preference groups for access constraints (i.e., finding land, hunting opportunities near their home, and crowding at hunting locations). However, there was some differences between the preference groups. Upland game hunters rated game population constraints (i.e., game abundance and ability to find game) as a greater limitation (mean = 3.15) than the deer preference hunters (mean = 2.49) (Table 2-3). Deer preference hunters rated cost constraints (i.e., cost of permits, travel, equipment, and processing meat) as a slightly greater constraint (mean = 2.13) than the upland game preference hunters (mean = 1.86). Further, the deer preference hunters (mean = 2.05) rated regulations (i.e., bag/tag limits and season dates) as slightly greater constraint than upland game preference hunters (mean = 1.90), but this difference was negligible.

Discussion

The continued changes in patterns of outdoor recreation participation bring about a challenge for natural resource managers to plan for the future because of uncertainty around types of recreation activities. This study attempted to better understand the reasons why individuals participate and the things that inhibit participation in hunting activities in Nebraska, under the context of game species preferences. In Nebraska, which is mostly composed of private land (Bishop et al. 2011), it was not surprising that we find both upland game and deer preference hunters primarily hunt on private land. Interestingly, access constraints were rated the greatest constraint, yet most individuals use private land as their primary place to hunt. The importance placed on hunting private

land may indicate that private land offers a unique experience or at least the perspective that there is a larger guarantee of satisfaction with the hunting experience (i.e. wildlife numbers, no competition with others) (Stedman et al. 2008). Previous research has seen that the number of rooster pheasants and deer seen has a correlation with hunter satisfaction (Heberlein et al. 1982, Frey et al. 2003). Therefore, if individuals hunt on private land, like our participants, and see more wildlife, they are likely to be highly satisfied. Additionally, this may suggest a reason as to why we see many participants seek out private land, even if it is moderately constraining to do so, by placing a value on their own satisfaction.

Spending time with family and friends was the top motivation for both upland game and deer preference hunters. Similarly, other research of both consumptive and non-consumptive outdoor recreation confirm that social aspects are important motivations (e.g., McFarlane 1994, Mehmood et al. 2003, Schroeder et al. 2006, Chapter 4). The importance of social aspects may be a top rating for motivations because upland game hunting is often done as a group instead of as a single entity (Wam et al. 2013). Deer hunters also have shown social aspects high (Decker and Connelly 1990) as individuals often hunt in parties or spend time butchering the animal together. Further, socialization occurs at multiple social scales. For instance, a father may take a child hunting; a community may host openers, teams work together during a hunting tournament (Chapter 4), and an individual can belong to a conservation organization. Societal-related motivations have been suggested to play a stronger role than harvest-related motivations, which suggests a greater need to manage for desired experiences by enhancing social interaction and less focus on achievement-related goals (i.e. obtaining a

bag limit). Managing the experience for the quality of the hunt, rather than the harvest success rate has been seen in other areas as well (Hammitt et al. 1989). For instance, Hammitt et.al. (1989) found that only 11% of respondents bagged a deer, but 66% were satisfied with the overall experience.

The top three constraint factors that emerged from our study were access, cost, and game populations. Nebraska is predominately private land, which pushes individuals (directly or based on perception) to actively seek and ask landowners for permission to hunt. Choosing to hunt private land requires more involvement, such as pursuing landowners for trespassing rights to hunt their property (Brown et al. 2000), than public land hunting. Asking landowners for permission to hunt on private land may be a daunting task because individuals will have to first find a piece of land they wish to hunt, figure out who owns it, and then fear rejection (or confrontation) of asking permission to hunt. The perceived difficulty of asking landowners for permission to hunt may be a considerable constraint to finding more access for those without a direct social connection to a private landowner. Hunter education classes or material provided by state management agencies in areas with a predominance of private land could help by developing approaches or coaching new hunters on the process and etiquette of talking with landowners. Cost was another highly rated constraint, particularly among deer preference hunters. Compared to upland game hunters, deer hunters may take their animal to get processed, which is an added cost over shooting a bird. Being a larger animal with more cuts of meat, the cost may be higher to process or even get mounted, if a trophy animal. Costs of permits, guns, blinds, and other hunting equipment add to the increase of costs associated with big game hunting. Additionally, private landowners may

charge an access fee. Constraints can be mitigated or overcome by the participant; therefore, knowing the reasons which limit or reduce hunting participation can guide management efforts for the future (Metcalf et al. 2015). For example, if land access is a constraint, there may be a possibility of developing a program that incentivizes landowners to open their private land to hunting. Further, if knowledge or skill is seen as a constraint, a management agency may be able to host a skill-building clinic that focusing on learning to use new equipment or how to select the best habitat for hunting.

Another constraint observed among our species preference groups was the limitation of game populations. The upland game preference group rated abundance game populations as a larger constraint than that of deer preference individuals. When we think about where individuals hunt these species, we realize it can be on two very different sizes of land and ties into the access constraint. For example, a deer hunter may have a hunting stand or blind set on 1 to 2 acres of land that they can see an animal and take a possible shot; whereas, an upland game hunter may end up walking 20 or more acres to shoot their bag limit or find a bird. So, an upland game hunter physically may require more land area or larger tracts to hunt (i.e. Conservation Reserve Program [CRP]). CRP is a program provided by the United States Department of Agriculture to enroll margin cropland back into native grasses, which also serves as habitat to many species. However, CRP is not open to the public on a normal basis, unless the landowner signs up for it, and is on a limited contract, meaning after 10-15 years, the CRP can be plowed up again for crops. Therefore, it is possible for the number of CRP acres to fluctuate, which can reduce present game populations' habitat. From 2012 to 2017 the nationwide CRP enrollment was reduced by over 6 million acres; however, Nebraska gained 150,000 acres

of CRP during that same time (U.S. Department of Agriculture (USDA) 2018). Understanding this difference in the amount of land necessary to hunt between deer preference hunters and upland game hunters, we see that is likely easier to find small tracts of land to hunt than the larger ones. Even though Nebraska saw an uptick in the amount of CRP acres, we are not sure if those acres allowed access to hunters. Clearly, the increase in acres does not show the amount of game abundance our hunters would like to see. Regardless, with an increase in potential acres, we still see the constraint upland game hunters are facing with respect to access and game population abundance.

We observed that grouse, rabbit, and waterfowl were the least consumed (or preferred) species among those assessed in this study. Being the least consumed, this indicates that people may not be actively targeting these species for recreation or consumption. Hunters may not target these species because of the terrain grouse are found in, usually requiring hunters to walk many miles, or lack of water sources to hunt waterfowl. Annual assessments of the numbers of hunters targeting these species has shown a steady decline over the past few decades (US Fish and Service 2018). There are many reasons why hunters may no longer want to target waterfowl and grouse, but these species were primarily indicated as being difficult to very difficult to hunt. Waterfowl and grouse may be perceived as requiring a greater degree of specialization and effort (Miller and Graefe 2000) or that success is more sporadic sport for some participants, where they do not pursue this species each year (Enck et al. 1993). Consequently, we know that social motivations are a big factor in hunting participation; therefore, even if people do hunt these species, they may wish to donate the meat to someone else. However, rabbit was rated as not difficult to hunt, but may require the harvest of greater

numbers to make the effort of hunting and cleaning worth it to a hunter, as has been observed among anglers (Chizinski et al. 2014).

In conclusion, we observed similar constraints between upland game and deer hunters in Nebraska. Access and cost were the two top rated constraints, whereas rules and regulations were less of a factor. It is difficult and expensive for managers to expand access or affect costs much. However, existing public land may be improved to increase the accessibility by increasing the number of parking lots to encourage dispersion of hunters (Wszola 2017). Many constraints seem to be of physical nature, such as land access and costs. Additionally, cost assistance may be an avenue to explore for hunters just getting started or as a way to get younger hunters involved, which could include form of a lower cost permit type for first time permit buyers or college student discounts. Further, because upland game and deer hunters are similarly motivated, managers can work to market toward those important motivations, rather than focusing on harvest. To enhance R3 efforts, we must begin adapting to our current situation and attempt to address constraints and build off hunting-related motivations.

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Table 2-1. Motivations to hunt among upland game and deer preference hunters in Nebraska. For each factor, the mean (SD), t value from t-test, p value, and Cohen's d effect size was calculated. Motivation questions ranged from "Not important" (1) to "Very important" (5).

Factor	Upland game preference	Deer Preference	*t*	P	Effect size
Setting motivation					
Spending time outdoors/experiencing nature	4.58 (0.65)	4.55 (0.70)	0.59	0.555	
Social motivation					
Spending time with family or friends	4.38 (0.86)	4.32 (0.97)	0.88	0.379	
Hunt motivations					
Harvesting a trophy animal	1.99 (1.20)	2.68 (1.30)	-7.74	<0.001	-0.542
Obtaining my bag limit/filling my tag	2.34 (1.13)	2.57 (1.22)	-2.75	0.006	-0.192
Providing meat for myself, family, or friends	2.74 (1.30)	3.65 (1.22)	-9.67	<0.001	-0.731
Managing game populations	3.13 (1.25)	3.62 (1.14)	-5.42	<0.001	-0.416
Enjoying solitude	3.79 (1.14)	4.06 (1.02)	-3.26	0.001	-0.253
Hunting for the challenge	3.61 (1.14)	3.94 (1.03)	-4.14	<0.001	-0.319
Opportunity to get a shot at an animal	2.99 (1.28)	3.03 (1.25)	-0.37	0.714	
Outwitting difficult-to-hunt species	3.23 (1.30)	3.47 (1.28)	-2.49	0.013	-0.183
Observing game species	3.86 (1.08)	4.06 (0.94)	-2.49	0.013	-0.196

Table 2-2. Descriptive statistics and factor loadings for hunter constraints based on limiting ratings by hunters in Nebraska, USA.

		Factor loadings				
Constraint	Mean (SD)	Factor	Factor	Factor	Factor	Factor
Permit cost	2.08 (1.20)	0.67	-0.05	-0.06	-0.02	0.16
Travel cost	2.04 (1.12)	0.68	0.17	-0.04	0.05	-0.05
Equipment cost	2.10 (1.09)	0.75	-0.02	0.05	-0.03	-0.01
Processing cost	2.02 (1.22)	0.58	-0.09	0.11	0.04	-0.02
Finding land	3.33 (1.51)	0.02	0.87	0.00	-0.04	0.01
Hunting opportunity	3.10 (1.46)	0.01	0.72	0.01	0.05	0.03
Crowding	2.73 (1.43)	0.02	0.53	0.03	0.07	0.03
Hunting partners	1.72 (0.99)	0.05	0.13	0.56	0.04	-0.07
Hunting skills	1.53 (0.81)	0.02	-0.04	0.70	-0.05	0.02
Other activities	1.86 (1.03)	-0.06	0.01	0.57	0.04	0.06
Eating wild game	1.40 (0.78)	0.00	-0.05	0.52	0.02	0.02
Game populations	2.70 (1.31)	0.01	-0.04	0.00	1.01	0.00
Finding game	2.61 (1.23)	-0.03	0.29	0.04	0.57	0.05
Bag limit restrictions	1.85 (1.09)	0.01	0.01	0.00	0.00	0.73
Season dates	2.16 (1.22)	0.06	0.07	0.07	0.03	0.48

Table 2-3. Differences in perceptions of constraints to hunting in Nebraska between upland game and deer hunters. For each factor, the mean (SD), t value from t-test, p value, and Cohen's D effect size was calculated for each class of constraints. Constraint questions ranged from "Not at all limiting" (1) to "Very limiting" (5).

Factor	Upland game preference	Deer preference	*t*	P	Effect size
Cost	1.86 (1.11)	2.13 (1.17)	-6.65	<0.001	0.243
Access	3.17 (1.49)	3.05 (1.50)	1.89	0.058	
Activity	1.67 (0.94)	1.59 (0.90)	2.18	0.029	-0.080
Game populations	3.15 (1.37)	2.49 (1.20)	9.43	<0.001	-0.487
Regulations	1.90 (1.16)	2.05 (1.17)	-2.19	0.029	0.113

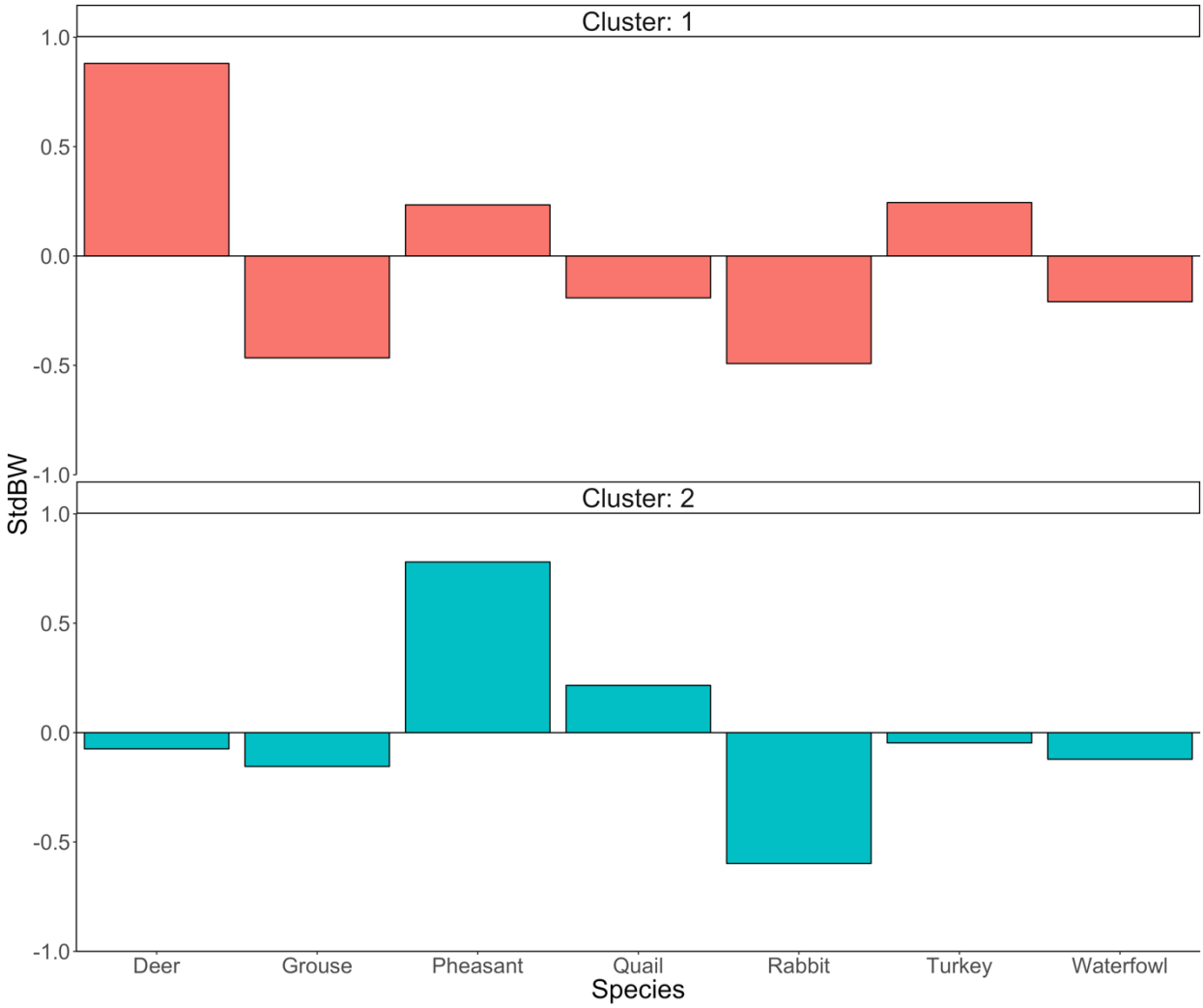

Figure 2-1. Standardized Best-Worst scores for species preferences for two clusters of hunters in Nebraska. Clusters determined through hierarchical clustering of individual Best-Worst scores.

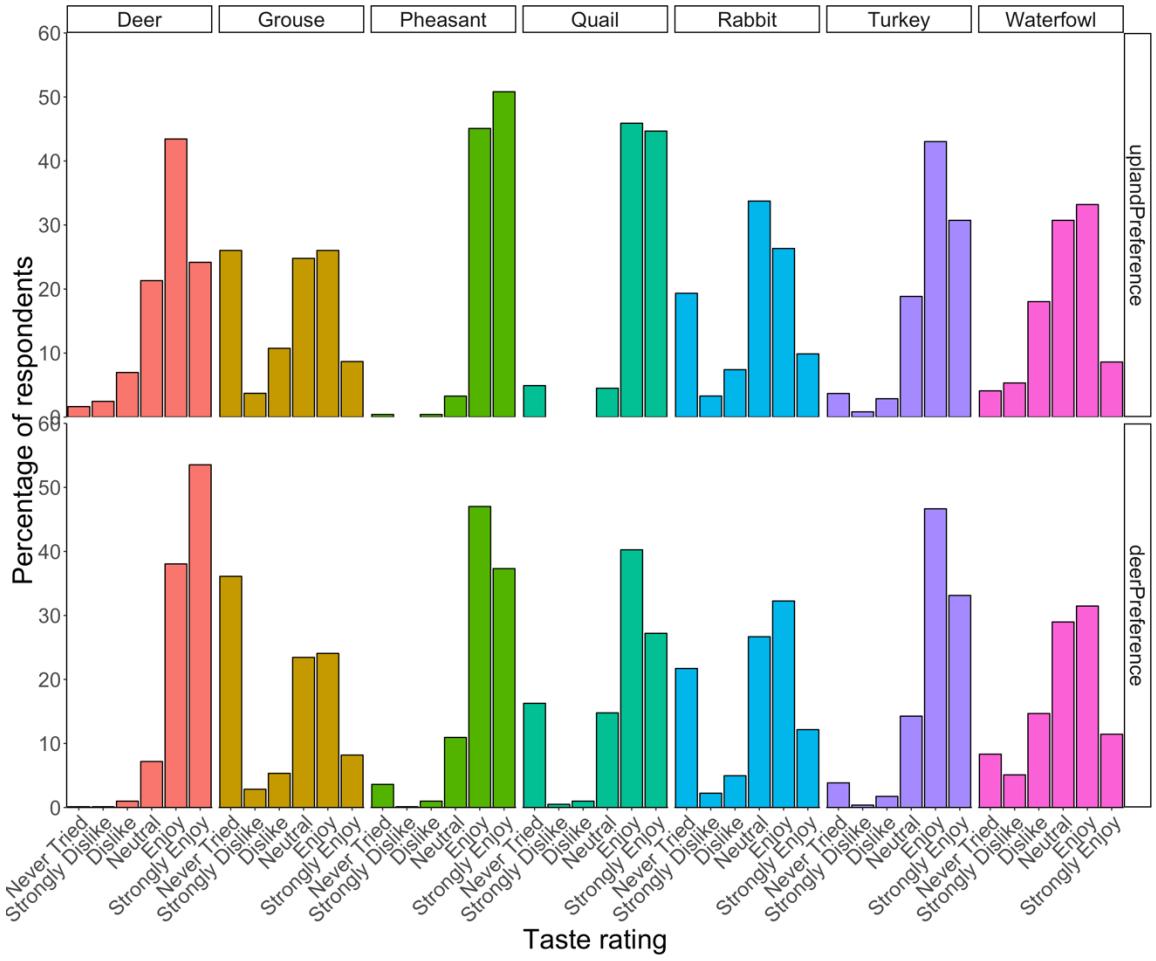

Figure 2-2. Perceptions of taste of game animals by upland game and deer preference hunters in Nebraska.

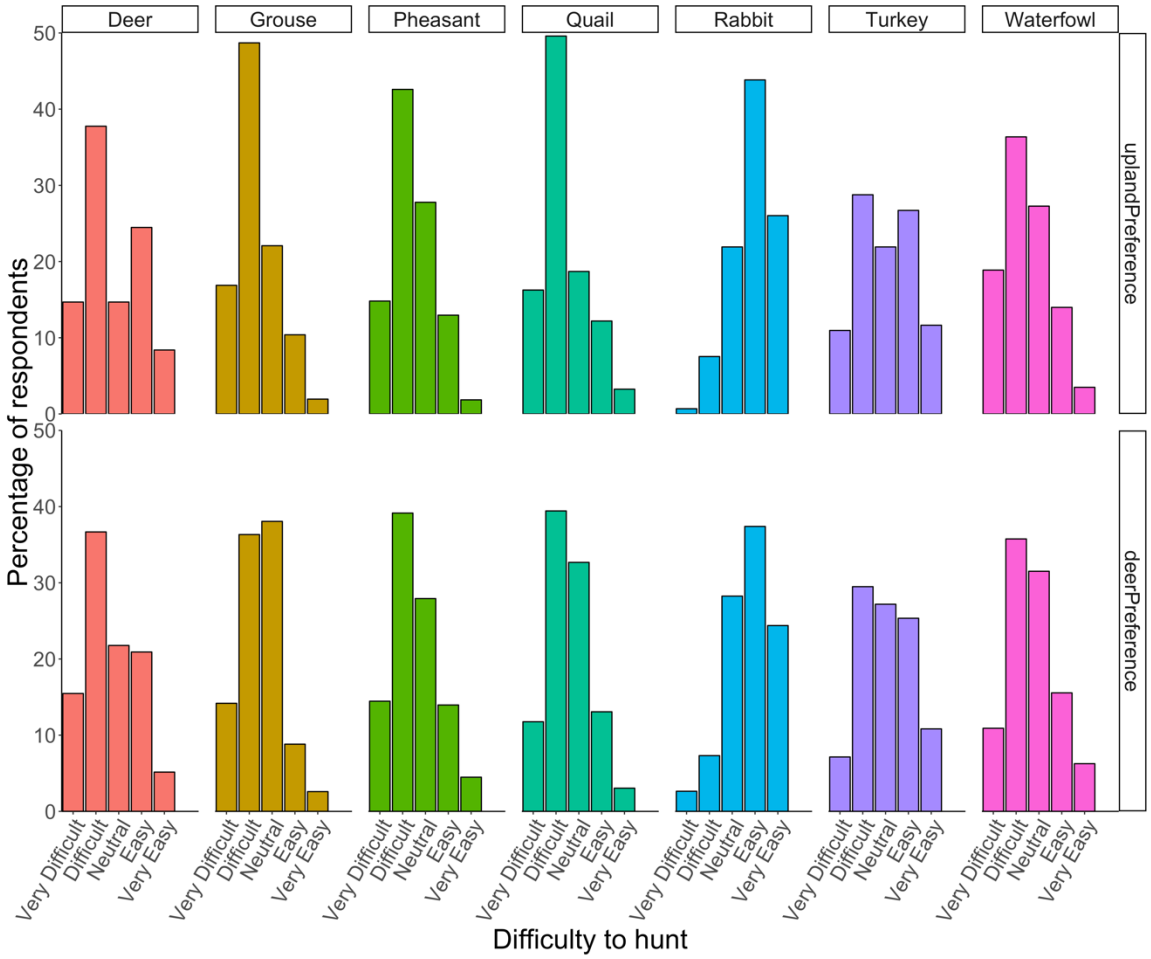

Figure 2-3. Perceptions of the difficulty of game animals by upland game preference hunters and deer preference hunters in Nebraska.

Chapter 3: Species Preferences and Identity of Nebraska Hunters

Introduction

Identity is a set of meanings that characterizes a person, guides an individual's behavior, and provides a way to understand ourselves while striving to be understood by others (Williams 2002, Burke 2004). As an individual we have differing values, tastes, opinions, and general characteristics about ourselves compared to others in society. An identity may be created through participation, possessions, affiliation with others who support a similar identity, behaviors, and interpretation of information (Schlenker 1984). Identity is complex and dynamic; individuals often have multiple identities at any one time. For example, an individual may identify as a waterfowl hunter, father, runner, and employee (Haggard and Williams 1992, Stets and Burke 2003, Schroeder et al. 2013). Identities may either complement or compete with each other because each identity draws different demands of time, energy, and financial resources (Jun and Kyle 2011). Identities can form through individual behavioral patterns or self-identification. Additionally, scenarios can change over time based on an individual's experience (i.e., a traumatic experience, change of heart, or education).

Identity Theory attempts to describe how an individual develops, maintains, or shifts identities is based on Identity Theory (Burke 2004). Identity Theory focuses around an identity standard, which is the result of interactions between individual personal beliefs (i.e., person identity) and societal constructs (i.e., role identity). The identity standard determines behavior; the comparator is the outcome of the behavior. An individual will routinely compare their behavior to the identity standard and assess their

satisfaction with the expressed identity. If the individual is not satisfied, they may change their environment or adopt another identity.

One expression of identity is through leisure activity (Haggard and Williams 1992). Individuals are likely to choose a leisure activity that provides opportunities for self-expression, allowing an individual to be perceived by others for who they really are (Dimanche and Samdahl 1994). From there, a leisure lifestyle is developed and gains directions through relationships within social circles that are composed of family, friends, and co-workers (Ditton et al. 1992). Therefore, an individual's social circle may influence what activities an individual does as well as that individual's behavior related to a leisure activity. If an individual's friend does not like to participate in a certain activity, the individual may follow suit and not participate. Likewise, if an individual's family participates heavily in a leisure activity, that individual may feel a need to continue a tradition. Social attributes and behaviors of an individual are important to understand because of the implications and contributions to participation rates of various leisure activities. We can determine the implications and contributions to leisure activities by investigating leisure identities.

Leisure activity provides the context for establishing identities of one's self through recreation. Individuals are motivated to bring the perceived self (i.e. how others see them) into congruence with the ideal self (i.e. how an individual wants to be seen) to achieve a desirable self-image (Haggard and Williams 1992). Leisure activities help to produce a self-image that is desirable through leisure symbols (e.g., running shoes, camouflage, fishing hats), that signify a certain identification (Haggard and Williams 1992). Leisure activities are freely performed behaviors, and thus influence one's self-

perceptions and allow individual's control over situations that affirm their identities. An individual may try multiple identities but only commit to a few or move back and forth between identities (Stets and Burke 2003). To attain their ideal identity, individuals are continually weighing their beliefs against the information acquired from their external environment with the intent of changing and adapting to the identity they are striving to obtain (Haggard and Williams 1992). Ways in which identity or identities can be manipulated include the individual's appearance, interactions with others, or interpretation of self, all reflecting behavior through participation with an activity (Haggard and Williams 1992). For example, an individual may choose hunting as their leisure activity in which special clothes or colors are necessary and serve as a leisure symbol. Hunters may decide not to interact with anyone in order to achieve solidarity. Behaviors expressed by each identity can be described by differing motivations and specializations.

Each identity has a driving force, or motivation, behind the expressed behaviors. For example, an individual identifying as an outdoorsman might have the motivation to connect with nature by going for a hike. Individuals vary in not only the level of motivation (i.e., how much motivation), but also in the orientation of that motivation (i.e., what type of motivation). The type of motivation refers to an individual's primary objective (e.g., accompany others, achieve a goal, or appreciate nature). Motivation orientations are a key concept to understanding leisure activities because orientation helps determine reasons why individuals participate in certain activities and provides an explanation with respect to hunting (Manfredo et al. 1996). Leisure motivation is a function of two expectancies: the effort (e.g., buying a permit) put forth as a result of the

motivation will lead to a performance (e.g., going hunting) and that performance will lead to positive outcomes (e.g., stress relief, goal achievement) (Schroeder et al. 2006).

There are multiple hunting approaches and species to hunt, and we can expect to observe a continuum in specialization that reflect an individual's identity. Behaviors exhibited by such leisure identities may vary in the degree of specialization (Ditton et al. 1992). Specialization involves the skills, equipment, and setting preferences used within a sport (Bryan 1977). Specialization also involves cognitive and psychological factors (Schroeder et al. 2013). Cognitive factors include skills and knowledge of an activity, while psychological factors include attraction and self-expression within the activity. Cognitive and psychological factors are part of the view of an individual's self and are expressed through recreation and leisure (Haggard and Williams 1992). In turn, expression of self-affirmation factors leads to establishing an individual's leisure identity. In addition, specialization includes the amount of investment (e.g., money, time, social obligation) in an activity, which is an indication that an individual is more likely to participate regardless of a positive or negative experience in that activity (Bryan 1977, Scott and Shafer 2001). Specialization is based on the idea of progression, where participation in an activity comes at the expense of other activities and skills develop over time, and where there is a continuum of least specialized individuals on one end and most specialized individuals on the other end (Ditton et al. 1992, Scott and Shafer 2001). Progress does not have to be linear but can vary over time based on an individual's lifestyle (Oh et al. 2010). Further, depending on how an individual identifies, they may make investments to become specialists in a single activity while others diversify their leisure portfolio by doing multiple (Backlund and Kuentzel 2013).

Among recreational hunters and anglers, multiple studies have assessed specialization. For instance, the skill level required to be successful during archery and rifle deer hunting may not be the same. Archery hunting requires extensive practice to accurately shoot and successfully harvest an animal. Additionally, archery hunting may entail supplemental preparatory activities such as scouting, whereas rifle hunting may require less equipment and preparation (Miller and Graefe 2000). Sportspersons may target a single species or focus on a suite of species. Bryan (1977) observed certain characteristics differed between angler types. For example, occasional and generalist anglers had less of a species preference than the more advanced technique specialists. Studying hunting preferences may provide a unique opportunity to study specializations and identities like fishing because hunting also requires special knowledge, participation, and equipment (Miller and Graefe 2000).

Understanding how wildlife hunting systems function requires information concerning social aspects of hunters (e.g., needs, patterns in participation), ecology of the prey (e.g., life history, population dynamics), and the components and process that govern interactions within the system. Understanding how hunters identify will provide insight into species preferences and provide resource managers with the information needed to better understand their user base and more effectively manage exploited populations. Factors, such as motivations and specializations, help identify and distinguish hunter identities, which can be used to manage recreational activity statewide. Additionally, knowing how specializations, motivations, and identities change over time may provide insight as to how individuals choose other recreational or non-recreational activities to substitute their previous activities. From there, managers may be able to

understand the participation patterns and manipulate hunters away from over utilized resources and encourage them to pursue underutilized resources (Martin and Pope 2011).

The overall goal of this research is to better understand the role of hunting identity and species preferences as related to specialization (i.e., centrality to lifestyle, skills, and self-expression). Identity offers a mechanism to differentiate recreationists and provide insight into the role of hunting as a leisure activity (Schroeder et al. 2013). The progression of identity allowed us to examine a developmental process and human behavior as expressed by hunting. Specifically, we examined how participants may differ through self -stated identities (i.e. non-hunter, apprentice hunter, current hunter, or former hunter) in the role of hunting in terms of centrality to life, skill development, and self-expression based on their game species preferences. This study will provide important information on the connection between how hunters see themselves and the species they prefer to hunt, with important implications for the recruitment, retention, and reactivation.

Methods

Survey

For this study, our study group consisted of individuals who purchased a small-game (i.e., small game or hunt fish combination) permit or a big-game (i.e. deer or turkey) permit at least once in Nebraska between 2010 and 2016. Individuals could have purchased any combination of the above permit types to be included in the sampling frame. Individuals must have been at least 19 years old at time of license purchase, a Nebraska resident, and had an email address on file. To estimate the number of

individuals we would send a survey invitation, we assumed a 20% response rate (based on experience with previous email surveys) with an error margin of 4% and a confidence interval of 95%. We drew a random sample of 7,000 individuals. Respondents were sent an email invitation (Appendix A) to an online survey (Appendix B) created through SNAP Survey Software (Mercator Research Group 2003). The survey link was active for one month, with an email reminder (Appendix C) sent each week to individuals who had not responded. All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20170717194 EX).

To compare demographics between the respondents of the survey and the non-respondents, we evaluated relative non-response bias in gender, residency, and average age of respondents using methods described in (Callegaro et al. 2015). Briefly, non-response bias is the difference between the expected value estimate based on respondents and the true value for population characteristics (e.g., gender, residency, and average age) on interest. Relative non-response bias is the proportion of the population characteristic of interest that the bias represents (Callegaro et al. 2015). Relative non-response bias is calculated by calculating the difference in mean of the value of interest from respondents and from non-respondents. The difference is multiplied by proportion of non-respondents relative to respondents and then the value of interest is divided by the mean of the entire sample population. Standard relative non-response benchmarks are between 5% and 10% (Callegaro et al. 2015).

Best worst scaling

Respondents were asked about species preferences using a best-worst scaling (BWS) method (Louviere et al. 2015). The BWS method is useful for creating concrete

and more discriminating findings compared to ranking methods because of the trade-off opportunities in respondents' responses (Lee et al. 2007). Therefore, BWS-scored data have minimal response style bias (Bolt and Johnson 2009), values are measured on a common scale, and provide relatively simple interpretation of the measurement scale (Marley and Louviere 2005). The difference in best-worst scores (i.e., the number of times an item is considered ''best'' and subtracting the number of times it is considered ''worst'') is a close approximation of the true scale values (Auger et al. 2007). To minimize the burden on the respondents from asking all possible combinations (i.e., a full factorial design), we used a balanced incomplete block design (BIBD) to assess the preferences of seven Nebraska species. The major benefit of using a BIBD design is that it is capability of greatly decreasing the number of choice sets to be evaluated, while maintaining the balanced occurrence and co-occurrence of items across the question sets with the number of items that appear in each set ideally must be fixed at three or more (Raghavarao and Padgett 2014). Following the BIBD approach, each respondent was given seven choice sets of four different species combinations (Appendix B). From each question set, the respondent could choose only one least preferred and one most preferred species in the set (Figure 3-1). The species used in the choice sets were: pheasant (*Phasianus colchicus*), waterfowl (duck, goose), deer (mule, whitetail) (*Odocoileus* spp.), quail (*Colinus virginianus*), rabbit (*Sylvilagus* spp.) or squirrel *(Sciuridae* spp.), grouse (sharptail *Tympanuchus phasianellus*, prairie chicken *T. cupido*), and turkey (*Meleagris gallopavo*). These species were chosen as these are the prominent game hunted in Nebraska and do not fall into a lottery system for permits. In each choice set, the order of the species was randomized for each respondent. The choice sets and species in each set

was determined using the crossdes (Sailer 2013) and the support.BWS package (Aizaki 2018) in R (R Core Team 2018).

For each respondent, we calculated our Best Worst (BW) score for each of the species by subtracting the number of times a species was selected as ‘‘least important’’ from the number of times that same species was selected as ‘‘most important’’ using the support.BWS package in R. Each of the species appeared in four sets, so that the individual-level scales for each ranged from -4 to +4. We then used Ward's D2 hierarchical cluster method (Murtagh and Legendre 2014) to classify respondents based on the simple BW scores (Auger et al. 2007). The appropriate number of clusters was found using the NbClust package (Charrad et al. 2014). After individuals were assigned to a cluster, we then calculated the standardized BW score (i.e., square root of the best count divided by the worst count scoring procedure) (Aizaki et al. 2014) for each cluster group to illustrate differences in species preferences.

Identity

To quantify waterfowl-hunting specialization, respondents replied to items adapted from Schroeder et al. (2013) on a scale of 1 (“strongly disagree”) to 5 (“strongly agree”). They also responded to an open-ended question about their years of participation in Nebraska hunting, number of days hunted per year, and if they hunt outside of Nebraska. To address how the hunters identified themselves, we used question adapted from Schroeder et al. (2013). This identity question asked respondents to describe their identification with hunting from four options: “I have gone hunting but do not consider myself a hunter”, “I am in the process of becoming a hunter”, “I consider myself a

hunter", and "I used to consider myself a hunter but no longer do". We classified these as "Non", "Apprentice," "Current", and "Former", respectively.

We used a confirmatory factor analysis (CFA) to test a four-dimension model of specialization among species-preference groups. The model was developed based on previous specialization models of waterfowl hunters (Schroeder et al. 2012). The CFA was fit using the lavaan package (Rosseel 2012) in R based on the maximum likelihood estimation procedure and the correlation matrix of the items measuring the motivations. We constrained the latent factors to have a mean of 0 and a variance of 1 (i.e. standardized them). In addition to factor loadings, we reported Cronbach's alpha reliability coefficients and the average variance extracted (AVE) as measures of validity of our model components using the semTools package (Jorgensen et al. 2018). A Cronbach's alpha greater than 0.60 suggests content validity and an AVE greater than 0.50 suggests acceptable discriminant validity. Goodness of fit indices (X^2; RMSEA, and CFI) were used in assessing the CFA fit. An advantage to RMSEA is the ability for the confidence interval to be calculated around its value. The goodness of fit calculates the proportion of variance that is accounted for the by estimated population covariance. Normally, the cut-off point for goodness of fit is 0.90., and ranges from 0 to 1 (Hooper et al. 2008).

We approached the analysis of specialization in two different ways. The first approach was using a multi-group Confirmatory Factor Analysis (CFA). The multi-group CFA allowed us to directly compare our latent construct of specialization based on the species preference groupings. Often differences between groups in terms of underlying constructs are assessed through differences in means. However, any

comparison of means presupposes that the questionnaires measure similarly between different groups; multigroup CFA directly tests whether the underlying construct (i.e., specialization) is measured similarly between different groups (i.e., species preference groups). Therefore, we used multigroup CFA to test the best fitting model for configural, metric, scalar, and residual invariance between species preference contexts (Steenkamp and Baumgartner 1998, Vandenberg and Lance 2000, Casper et al. 2011). Configural invariance means that measurement items load on the same constructs across models, while metric, scalar, residual invariance means that item factor loadings, intercepts, and residuals (errors) are statistically equal across models, respectively (Steenkamp and Baumgartner 1998, Vandenberg and Lance 2000). Configural invariance was judged by whether the multi-group model had acceptable fit statistics. Metric, scalar, and residual invariance were judged based on $\chi 2$ difference and CFI difference tests between each invariance model compared with the configural invariance model. For the model to be declared invariant at each level, the $\chi 2$ difference test should be insignificant and the CFI difference should be 0.01 or less. The fit statistics are differentially affected by unbalanced group sizes. Thus, although it is permissible to conduct multiple-groups CFA with unequal sample sizes, it is preferable for the sizes of the groups to be as balanced as possible (Brown 2014). To ensure that the numbers of individuals from each species preference group were similar, we randomly sampled without replacement from the larger group. The seed was adjusted to draw different samples to identify if there were differences from sample draw, but preliminary analysis suggested little qualitative difference between random samples. All multigroup CFA analysis was conducted using semTools in R.

The multigroup CFA can be affected by differences in sample sizes, thus we chose a second approach to verify the results from the multigroup CFA. We assessed differences among the specialization constructs and group characteristics between species preference groups and hunter self-identification using $\chi 2$ analysis and independent sample t-tests (Vaske 2008). We reported measures of effect size for Cramer's V for chi-square analysis using the package vcd (Meyer et al. 2017) and Cohen's d for t-tests using the package effsize (Torchiano 2017). We used ANOVA to examine trends in specialization measures between identities within each species preference groups. We reported Welch's F in cases where variances were significantly different, and omega squared ($\omega 2$) for ANOVA effect size. Omega squared provides an unbiased estimate of r based on sums of squares and error variance; <0.01, 0.01, 0.06, and 0.14 representing negligible, small, medium, and large effects.

Results

Survey Response

A total of 7,000 surveys were sent to individuals. Out of 7,000 surveys, 833 emails bounced and were not received by individuals; therefore, this left us with a grand total of 6,167 successfully emailed survey invitations. Of the revised total (n = 6,167), we had 1,327 individuals respond and complete the survey, which was an overall response rate of 21.5%. The average age of small game respondents (47 years) was greater than the average of non-respondents (44 years) and the sample population (45 years, 6% relative non-response bias). The average age of big game respondents (45 years) was greater than the average of non-respondents (43 years) and the sample population (43 years, 4%

relative non-response bias). A smaller proportion of small game female hunters (5%) responded to the survey than were present in either the non-respondent group (7%) or the sample population (6%, 20% relative non-response bias). A smaller proportion of d female hunters (10%) responded to the survey than were present in either the non-respondent group (13%) or the sample population (12%, 17% relative non-response bias).

Species Preferences

The most appropriate number of clusters among species groups was two. There were 850 (76%) respondents that belonged to cluster 1 and 265 respondents (24%) that belonged to cluster 2. Cluster 1 was indicated by a strong preference for deer and less so by pheasant and turkey (standardized BW scale; Figure 2-1). Cluster 2 was indicated by a strong preference for pheasant and less so by quail. Species such as grouse, rabbit, and waterfowl were not preferred by either group, with rabbit consistently the least preferred.

Hunters that preferred upland game were older (mean ± SD; 52.3 ± 13.0) than hunters that preferred deer (46.4 ± 13.0) ($t = 6.15$, $df = 393.54$, $P < 0.001$, Cohen's $d = -0.453$). There were relatively fewer females among hunters that preferred upland game (1.7%) than the deer preference hunters (8.9%) ($\chi^2 = 13.16$, $df = 1$, $P = 0.002$, Cramer's $V = 0.117$). In addition, there were relatively fewer upland game preference hunters that had hunted in the previous two years (88%) than those hunters that preferred deer hunting (94%) ($\chi^2 = 10.81$, $df = 1$, $P = 0.001$, Cramer's $V = 0.105$). There was a significant difference between the types of land hunted between the two preference groups ($\chi 2 = 24.96$, $df = 3$, $p = <0.001$, Cramer's $V = 0.154$). Upland game preference hunters primarily hunted on both private and public land (43%), followed by private land where

permission is required (28%), followed by then by private land that was owned or leased (17%), and lastly by public land open to hunting (12%). Deer preference hunters primarily hunted on private land where permission is required (42%), followed by both private and public land (29%), then by private land that was owned or leased (21%), and lastly by public land open to hunting (8%). Approximately one-third of the deer preference and the upland game preference group did not have someone serve as a mentor for them (33% and 36%, respectively). However, 56% of deer preference group currently serve as a mentor to someone while 46% of the upland game preference serve as a mentor.

Specialization construct between species preference groups

Initial CFA results of the specialization construct model indicated poor fit of the model with multiple modification indices (MI > 10) among the gear constructs, suggesting poor discriminant reliability. Cronbach's alpha (cluster 1 = 0.36, cluster 2 = 0.28) indicated poor reliability of these question sets. Therefore, we dropped those questions related to the equipment construct and refit the model. The simultaneous fitting of the CFA model of specialization indicated that there was acceptable content and discriminant validity among the specialization constructs, and a reasonable model fit overall (Table 3-1). There was little change in Δ CFI (< 0.01) for the metric, scalar, and residual invariance, which indicates that the relationship between the loadings, intercepts, and residuals were the same between species preference groups (Table 3-2).

Identity and specialization among species preference groups

For identity among the deer preference group, 4% (n = 29) indicated "I have gone hunting but do not consider myself a hunter", 2% (n = 20) indicated that "I am in the process of becoming a hunter", 90% (n = 729) indicated that "I consider myself a hunter", and 4% (n = 34) indicated that "I used to consider myself a hunter but no longer do" (Table 3-3). For identity among the upland game preference group, 5% (n = 12) indicated "I have gone hunting but do not consider myself a hunter", 2% (n = 6) indicated that "I am in the process of becoming a hunter", 82% (n = 201) indicated that "I consider myself a hunter", and 10% (n = 25) indicated that "I used to consider myself a hunter but no longer do". Deer preference hunters rated the centrality to life greater than the upland game preference group ($t = 10.80$, $P < 0.001$, Cohen's $D = 0.347$), whereas skill development and self-expression were similar between the two groups. The upland game preference group hunted for more years in Nebraska (and were also older) than the deer preference group, while the deer preference group hunted more days than the upland game preference group (Table 3-3). A greater percentage of upland game preference group (50%) hunted outside Nebraska than the deer preference group (36%), although the effect size was small ($\chi2 = 14.90$, $P < 0.001$, Cramer's $V = 0.121$). Similarly, a greater percentage of the upland game preference group belonged to local, regional, or national hunting organizations (41%) than the deer preference group (33%), although the effect size was negligible ($\chi2 = 5.59$, $P = 0.02$, Cramer's $V = 0.075$).

We observed an effect of self-identity (e.g. "Non", "Apprentice", "Current", "Former") on specialization factors within the species preference groups (Table 3-4). Those that did not identify with being a hunter ("Non") rated centrality to life, self-

expression, and skills lower than most other identification groups. Those hunters that identified as current hunters in both species preference groups, rated centrality to life, self-expression, and skills higher than most other identification groups, whereas the apprentice and former hunters rated things most similarly. The effect size was greater among those in the upland game preference group than was in the deer hunting group (Table 3-4).

Discussion

This study aimed to further comprehend the skills and preferences related to a hunting identity among Nebraska resident hunters. We gained a better understanding of our participants such that management implications can be addressed and to better meet the expectations and needs of Nebraska hunters Several observations were made by relating recreational specialization and hunting identity measures, such as two cluster groups (by species) and the years of experience they had hunting. Knowing from previous literature that identities and specializations may regress or remain strong even after hunters abandon their identities (Schroeder et al. 2013), it presents a unique opportunity for continued game management support, along with the ability to reactive hunters after abandoning the activity. As the decline in participation continues, researchers have examined how skills, knowledge, and commitment to an activity may remain high (Kuentzel and Heberlein 2006, Needham et al. 2007). For instance, we need strong behavioral ties to hunting identities so that a lack of support does not impede wildlife funding for programs and cultural traditions. A person may change their behavior, and ultimately identity, if a risk (i.e. human health) is associated with the recreation that is greater than they enjoy (Needham et al. 2007).

When examining specialization factors associated with identities, we observed that those individuals not considering themselves a hunter still have strong ties to an identity for deer hunting and upland game hunting in the form of self-expression (Table 3-4). There are similar trends follow suite for both deer preference and upland game preference hunters regarding identities as they move from non, apprentice, current, and former identities. Among the all identities (deer and upland preference), skills continue to rise as a person goes from non to apprentice to current, and then declines as a former hunter. However, the former hunter skills remain higher than that of a non-hunter, which makes sense because as an individual becomes more involved in a sport, they acquire new skills and continue to learn or better those skills. Once a person becomes a former hunter, they no longer are actively seeking to learn new skills but may remain relatively knowledgeable with what they previously had learned.

Some interesting concepts start to occur when we look at the role centrality plays in identities. Current deer preference hunter's identification had a greater mean rating (4.04), by nearly 1 full point, than that of apprentice deer preference hunters (3.08) in the centrality factor, which we speculate could come from the investment individuals have put into making hunting (big or small game) their top recreation priority. We observed a similar trend in moving from an apprentice hunter to a current hunter among the upland game preference group, regarding centrality to life as well. The deer preference group did rate centrality to life more highly than the upland game preference group among three of the identity types. Therefore, we believe that Nebraska deer hunters put more value to hunting as being a part of their lifestyle than that of upland game hunters, which could be because vacations or traditions are placed around deer hunting more. Another speculation

we have is that deer hunting in a shorter season length (rifle) than that of upland game, so there may be more of a focus on effort (e.g. scouting) or investment put into deer hunting versus upland game. Investment could come in the form of time, money, emotion or any other attribute that makes an individual feel they have a significance with the activity (Ditton et al. 1992). Participants that are quite invested in an activity will continue to carry out their endeavor even if confronted with a constraint (Barro and Manfredo 1996).

Different identities may facilitate one another. For example, identification as a deer hunter may facilitate the identification as a turkey hunter. Further, how one identifies may be closely related to gender, mentorship, and cultures (Stedman and Heberlein 2001). Individuals from our study that preferred upland game hunting were older, belonged to more organizations, and traveled out-of-state to hunt more than hunters that preferred deer. Interestingly, we observed that more individuals who identify with deer hunting serve as a mentor than individuals identifying with upland game, even though upland game identities seem to be more "involved" regarding hunting out of state and being a part of an organization. An absence of upland game hunter mentors may have an implication for future upland game hunters. For instance, the older-aged males with upland game preference identities may not wish to mentor a younger generation due to other obligations (e.g., family, health, other recreation). Previous research has found that social influences are important to develop a hunting behavior and likely form an identity associated with hunting (Hayslette et al. 2001). For example, Hayslette et al. (2001) indicated that early initiation into hunting and family tradition (i.e., childhood socialization) was important in developing hunting behavior among both dove and non-dove hunters in Alabama. Although attitudes are an important factor in the decision to

hunt, social pressures and surroundings drive the decision to hunt as well. Since social influences play a role among developing an identity; therefore, having a supportive social circle (i.e. mentor) allows an individual to develop a hunter identity in a supportive manner.

We made an initial step of tying species preferences and identity based on specialization among hunters in Nebraska. Further research should build on the psychological (i.e. attitudes) aspects to improve understanding of recreation behavior. It would be important to further identify how species preferences directly tie into identities (e.g., identification as a deer hunter or waterfowl hunter). Measuring identity and specialization offers a useful tool in differentiating recreationists and understanding participation patterns, which may help natural resource managers in recruitment and retention efforts by marketing program activities that may pertain to a specific group of individuals to get them involved. Our research indicated that among Nebraska hunters, based on species preference groups, there is little differences between identities and species preference groups. When we consider improving our recruitment, retention, and reactivation (R3) efforts, it is critical to understand that there are many similarities among our preference groups; however, the key difference, such as centrality to lifestyle, is something that is hard to obtain and is not necessarily a teachable concept to put into R3 efforts in Nebraska.

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Table 3-1. Confirmatory Factor Analysis (CFA) of specialization dimensions among species preference groups. The model fitting was run simultaneously (i.e., multigroup CFA). Model fit parameters were: CFI = 0.964, TFI = 0.955, RMSEA = 0.062, SRMR = 0.040

	Deer			Upland game		
Factor items	CR	AVE	Factor loading	CR	AVE	Factor loading
Centrality of life	0.90	0.58		0.90	0.61	
"If I stopped hunting, an important part of my life would be missing."			0.87			0.88
"Hunting is an annual tradition that has become important to me."			0.79			0.76
"Participation in hunting is a large part of my life."			0.87			0.91
"Given the effort I have put into hunting, it would be difficult to find a replacement activity."			0.83			0.81
"I plan vacation time around hunting seasons."			0.67			0.70
"I spend a lot of time before the season scouting the area in which I will hunt."			0.57			0.62
Skills	0.73	0.41		0.76	0.47	
"Given the hunting skills/knowledge I have developed, it is important I continue to hunt."			0.86			0.90
"Testing/improving my hunting skills is more important than harvesting an animal."			0.52			0.53
"I would describe my skill level in hunting as advanced or expert."			0.61			0.63
"It takes a great deal of skill to become a successful hunter."			0.49			0.64
Self-expression	0.79	0.57		0.79	0.56	
"When I am hunting, others see me the way I want them to see me."			0.82			0.78
"You can tell a lot about a person when you see them hunting."			0.73			0.66
"When I am hunting I can really be myself."			0.78			0.78

Table 3-2. Fit from multigroup confirmatory factor analysis.

Fit	Df	$\chi 2$	$\chi 2$	Δ df	cfi	rmsea	Δ cfi
Configural	124	242.01			0.960	0.064	-
Metric	134	260.09	18.08	10	0.957	0.064	0.003
Scalar	144	286.69	26.60	10	0.951	0.066	0.006
Residual	147	309.12	22.43	3	0.945	0.007	0.007

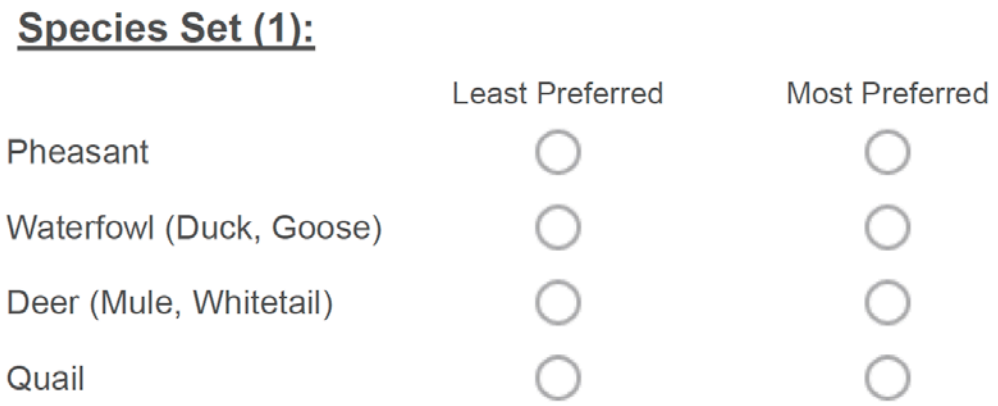
Table 3-3. Frequencies of identities and mean scores on specialization indices for species preference groups. For identities, hunting outside of Nebraska, and whether the individual belonged to a hunting related organization the percentage of each group is reported.

Factor	Deer preference	Upland game preference	*t* or $\chi 2$	P	Effect size
Identity					
Non	4	4	14.37	0.002	0.117
Apprentice	2	2			
Current	90	82			
Former	4	10			
Centrality to life	3.91	3.51	10.80	< 0.001	0.347
Skills	3.82	3.75	2.06	0.040	0.076
Self-expression	3.92	3.86	1.42	0.157	0.061
Years hunting	26.28	32.45	-5.32	< 0.001	-0.392
Days hunting	18.67	15.89	2.17	0.03	0.125
Hunt outside NE					
Yes	36	50	14.90	< 0.001	0.121
No	64	50			
Belong to hunt org.			5.59	0.02	0.075
Yes	33	41			
No	67	59			

Table 3-4. Specialization by hunter identity among species preference groups for Nebraska hunters. All F values were significant at $p < 0.01$. F is reported because of a significant Levene's test indicating variances are significantly different in groups. Means with different letter superscripts across each row are significantly different at $p < 0.05$ using Scheffe post-hoc tests.

	Mean rating				Effect of identity on specialization	
Factors	Non	Apprentice	Current	Former	F	ω^2
			Deer preference			
Centrality	2.53^{a}	3.08^{b}	4.04^{c}	2.93^{b}	203.26	0.114
Self-expression	3.38^{a}	3.68^{ab}	3.96^{b}	3.55^{a}	20.32	0.023
Skills	2.95^{a}	3.29^{ab}	3.89^{c}	3.37^{b}	47.16	0.049
			Upland game preference			
Centrality	1.96^{a}	2.89^{b}	3.75^{c}	2.53^{b}	96.62	0.171
Self-expression	3.14^{a}	3.83^{ab}	3.91^{b}	3.85^{b}	8.50	0.030
Skills	2.60^{a}	3.5^{bc}	3.88^{b}	3.33^{c}	24.33	0.104

Figure 3-1. Example of the best worst scaling questions used in the survey.



Chapter 4: Tournament Grouse Hunters in Nebraska

Introduction

Concern over declining participation in hunting and fishing (US Fish and Service 2018), and the future of funding for fish and wildlife management (Vrtiska et al. 2013, Winkler and Warnke 2013), has led to increased efforts to understand the motivations, preferences, satisfactions, and demographics of participants in fishing and hunting (i.e., anglers and hunters). To counteract the decline in hunter and angler participation, fish and wildlife agencies have focused efforts on the recruitment, retention, and reactivation (R3) of hunters and anglers, with concentrated efforts on the recruitment of youths (< 16 years of age). However, younger-aged individuals have many competing interests (e.g., work, sports, school), and thus may have less time to devote to hunting and fishing (Godbey 2009). Alternatively, older individuals have more disposable income and greater control of their free time (McNeilly and Burke 2002), and thus may be an important group to target with recruitment efforts. Management agencies, non-governmental organizations, and private organizations that provide events that target the interests and motivations of this demographics may find greater success in recruiting older individuals into hunting and fishing activities than has been observed with the focus on youth (Everett and Gore 2015).

During the timeframe that there has been the decrease in hunting and fishing participation (US Fish and Service 2018), there has been an increase in the number of and participation in tournament fishing events (Wilde et al. 1998). As many as one-in-five anglers participate in fishing tournaments in Wisconsin (Petchenik 2009). Broadly

defined, a fishing (or hunting) tournament is a competition with the goal of catching or harvesting the most or largest game, often with prizes awarded to the winner. Participants must comply with fish and wildlife regulations, ensuring that game that is caught or harvested is done legally by licensed participants following size and bag limits. Some tournaments may seek to make a profit, while others are conducted to raise funds for charitable causes, including conservation. Still other tournaments are simply social events designed to enhance the fishing and hunting experience available in a community. Tournaments can be organized for in-person participation or virtually through social media.

Tournament anglers tend to be more specialized than do non-tournament anglers (Hahn 1991, Schramm Jr et al. 1991) and vary in terms of demographics and reasons for participating (i.e., motivations) (Wilde et al. 1998). A motivation is the underlying reason that drives an individual's behavior to engage in an activity (e.g., physical, psychological, emotional reasons) (Beardmore et al. 2011). Tournament participants may differ from the general population. For example, tournament anglers in Texas were younger, fished more often, and viewed themselves as more skilled. Tournament anglers also differed significantly from non-tournament anglers based on catch-related motivations. Tournament anglers rated the experience of the catch, the challenge or sport, to obtain a ''trophy'' fish, to test equipment, to win a trophy or a prize, and to develop skills greater and to obtain fish to eat less than non-tournament anglers. Non-catch related motivations (e.g., social aspects) were similar between tournament and non-tournament anglers (Wilde et al. 1998). However, tournament anglers rated experiencing adventure and

excitement and experiencing new and different things greater than non-tournament anglers did.

Hunting tournaments have received considerably less attention in the scientific literature than fishing tournaments. Hunting tournaments tend to focus on the harvest of small (e.g., squirrels, rabbits), upland game (e.g., pheasants, quail), or those considered nuisance species (e.g., prairie dog, coyote). Hunting tournaments tend to follow the same framework as fishing tournaments in respect to time limits and regulations. For example, hunters begin hunting around the same time and continue until bag limits are reached or time expires. Further restrictions may be placed on hunters such as limited number of shells that can be used or number of dogs. One large difference between hunting and fishing tournaments, is that outcome of hunting tournaments is mortality of the game species, whereas fishing tournaments abide by the social norm of limited mortality of caught species (Muoneke and Childress 1994). In many cases, tournament anglers are penalized for fish that do not survive (Schramm et al. 1987)

Like fishing tournaments, hunting tournaments may be a mechanism for social cohesion and community development among participants (Brown et al. 2000). In addition, it may be a tool to engage hunters and help influence the recruitment, retention, or reactivation of hunters. Further, understanding the differing needs of hunters (i.e., tournament and non-tournament) to resolve conflicts and competing desires from management is very important (Wilde et al. 1998). Before we can explore tournaments as a tool, a basic understanding of who hunts in tournaments and why they participate is needed. We addressed this basic information need by studying hunters that participated in a grouse (*Tympanuchus* spp.) hunting tournament in Nebraska. The objectives of this

study were to: 1) identify a basic understanding of the demographics of who participates in a hunting tournament, and 2) identify the underlying attitudes and motivations of tournament hunters.

Methods

Study System

The "Sharptail Shootout" is a small tournament (~ 21 teams) hosted in the sandhills of Nebraska (Figure 4-1). Teams of five individuals (21 years and older) hunt ~4,000 acres of private land in Cherry, Grant, Hooker, and McPherson counties during the September grouse season. The Sharptail Shootout consists of an appreciation banquet with landowners, a trap shoot competition, the grouse hunt, an awards banquet, and a Past Shooters meeting. During the hunting tournament, teams can harvest Sharptail Grouse (*Tympanuchus phasianellus*) and Prairie Chicken (*T. cupido*). Each team is provided 25 shotgun shells and allowed one dog per team member. Winning teams are determined by the most birds in the team bag, fewest number of shells used, and quickest time completed. This competition follows all Nebraska Game and Parks Commission (NGPC) regulations, including required permits (small game permit) and a bag limit of three birds per individual (Nebraska Game and Parks Commission 2018). No birds were released for this event.

Survey

On September 15 and 16, 2017, a paper questionnaire was handed to individuals in person who wished to participate in the survey and collected once completed during trap shoot and social events at the Sharptail Shootout. The paper survey consisted of 20

questions regarding hunting experience, mentorship, motivations for participating in the tournament, and demographics (Appendix D). All protocols and survey instruments were approved by the University of Nebraska-Lincoln Institutional Review Board (IRB Approval #: 20170917520 EX).

We based motivation questions on the Recreation Experience Preference (REP) scale to measure motivations (Manfredo et al. 1996). For this study, 19 items were used that dealt specifically with hunting and outdoor recreation, and where necessary, modified to reflect hunting in a tournament setting (Table 4-1). We examined motivations based on four broad categories of questions: scenery, social, competition, and hunting. Scenery type questions included: a) to spend time outdoors, and b) to experience nature. Social type questions included: a) hunt with family, b) to spend time hunting with friends, c) relax with family, d) to spend relaxation time with friends, e) to meet new people, and f) to be part of tradition. Competition type questions included: a) to compete with my teammates b) to compete between other teams, c) to obtain my bag limit, d) for the competition of the trap shoot, e) for the opportunity to show off my skills, and f) for the challenge grouse provide. Hunting specific type questions included: a) for the opportunity to hunt Sharptail grouse, b) for the opportunity to hunt Prairie Chicken, and c) for the opportunity to hunt in great habitat (Table 4-2). All variables were coded on five-point scale from one, “not important”, to five, “very important”.

We used a confirmatory factor analysis (CFA) to test a four-dimension model of hunting tournament. The model was developed based on previous motivational models of anglers (Anderson et al. 2007, Schroeder and Fulton 2014) and hunters (Schroeder et al. 2012), with a focus on a tournament context. The CFA was fit using the lavaan

package (Rosseel 2012) in R (R Core Team 2018) based on the maximum likelihood estimation procedure and the correlation matrix of the items measuring the motivations. We constrained the latent factors to have a mean of 0 and a variance of 1 (i.e. standardized). In addition to factor loadings, we reported Cronbach's alpha reliability coefficients and the average variance extracted (AVE) as measures of validity of our model components using the semTools package (Jorgensen et al. 2018). A Cronbach's alpha greater than 0.60 suggests content validity and an AVE greater than 0.50 suggests acceptable discriminant validity. Goodness of fit indices (X^2; RMSEA, and CFI) were used in assessing the CFA fit. An advantage to RMSEA is the ability for the confidence interval to be calculated around its value. The goodness of fit calculates the proportion of variance that is accounted for the by estimated population covariance. Normally, the cut-off point for goodness of fit is 0.90, and ranges from 0 to 1 (Hooper et al. 2008).

Results

At the time of writing this, the authors could find no literature published in the peer reviewed or conference proceedings about hunting tournaments (Appendix E). Sixty-nine of 115 individuals participated in the study, with two individuals that refused to do the survey, indicating we surveyed 62% of tournament participants. Sharptail Shootout surveyed participants were primarily male (97%) and an average age (± SD) of 45 ± 10.95 years of age. Fifty-five percent of Sharptail Shootout surveyed participants were from outside of Nebraska. The mean (± SD) years participating in hunting of any kind was 32 ± 11.79 years. The average amount of time hunting grouse was 15 ± 12.03 years. The hunting participants also engaged in other types of hunting (in order of

frequency of reporting): waterfowl, pheasant, and deer. Sixty-four percent of the participants hunt grouse outside of the tournament. Respondents ranked hunting with dogs as important to very important (Table 4-3). The mean reasons (ranked from highest to lowest) for hunting with dogs were: 1) for the added enjoyment of the hunt was 4.61 ± 0.74; 2) to watch the dog work was 4.49 ± 0.72; 3) to increase chances of finding birds was 4.48 ± 0.67; 4) to have a hunting companion was 4.41 ± 0.86; 5) to be a part of a tradition was 3.93 ± 1.17. Fifty-eight percent of the participants competed in other recreational activities (e.g., fishing tournaments, archery shoots). The mean number of years participating in the tournament was 6.06 ± 5.94 (median was 3 years), but few hunted with all the same team members every year.

During the tournament, the mean number of hours spend afield was 8 ± 1.40 hours, with a range of 4 to 10 hours. Most (88%) participants used a dog during the tournament. More Prairie Chicken (n = 106) were harvested than Sharptail Grouse (n = 100). Of the Sharptail Grouse and Prairie Chicken that were harvested, the majority (66% and 55%, respectively) were females. The mean number of birds bagged per team was 9.0 ± 5.22 birds, with the range being from 0 to 15.

Initial CFA results of the 4-construct model of CRA indicated poor fit of the model to the data with multiple large modification indices (MI >10), suggesting issues with both convergent and discriminant reliability. A series of modifications were made to the models by removing problematic items to improve the fit of the model. Two of the most problematic of the original items was hunt with family and relax with family, which had lambda modification indices (MI) of greater than 10 across all constructs, indicating

that these items could not distinguish between the four constructs. This was likely because most respondents (n = 50) did not visit the tournament with family. Given the problems with these items, they were dropped and re-analyzed with the other 16 items. Removal of items hunting with family and relaxing with family resulted in significant improvement to model fit, and a large decrease in the number of large MIs. In the next iteration of the analysis item solitude was removed because of its weak loadings.

Cronbach's alpha coefficients for the hunter tournament motivation model indicated reliable internal consistency, suggesting that the variables adequately measured their respective dimensions (Table 4-1). Alphas ranged from 0.64 (social) to 0.86 (hunting species and place). The AVE ranged from 0.32 (scenery) to 0.76 (hunting species and place). The CFA four-dimensional model of hunting tournament motivations indicated an adequate fit to the data (CFI = 0.91, RMSEA = 0.07, SRMR = 0.08). All factor loadings were significant at $p < 0.001$ and acceptable, ranging from 0.44 to 0.64 for scenery, 0.38 to 0.67 for social, 0.26 to 1.15 for competition, and 0.45 to 1.0 for hunting species and place. Mean scores and standard deviations were also recorded for each motivation (Table 4-2). Correlations between the factors was Scenery to Social = 0.45, Scenery to Competition = 0.16, Scenery to Hunting = 0.22, Social to Competition = 0.24, Social to Hunting = 0.53, and Competition to Hunting was 0.27. Our CFA model suggested a reasonable scale to measure four constructs of motivations to participate in a hunting tournament. The model indicated that there was low to moderate correlation between the factors, with the greatest correlation existing between the Social motivations and the Hunting motivations. Internal consistency was adequate (Cronbach's alpha > 0.60) as was composite reliability (Omega > 0.60) for all factors. However, two of the

factors (Social and Competition) have average variance extracted values less than 0.5, indicating that the latent variables are not explaining a substantial amount of variance in its indicators. Although our final model had an acceptable fit, caution should be used in generalizing results to other tournaments and hunters. Because modifications were made to the hypothesized model, the revised model should be viewed as adjustments necessary to fit the model to this sample (MacCallum et al. 1992).

Discussion

We observed that most of the participants were middle-aged and male, which is not surprising given the demographics of the hunting population (US Fish and Service 2018). Many participants were motivated to participate in this tournament to spend time with friends (i.e. the social aspect); therefore, it made sense that most teams were made up of individuals who were friends. However, it was interesting to observe that most participants were from out-of-state, indicating that travel costs to participate in the tournament were not limiting and provided an indication that this tournament might be treated as a vacation. Several studies of "sports travelers" have suggested greater affluence than the general traveler (Schreiber 1976, Gibson and Yiannakis 1994, Attle 1997) Further, these tournament hunters had a lot of hunting experience, with the average of over 30 years, indicating a greater level of skill. An extensive background, and heightened skill level, in hunting may be a precursor to getting involved in a recreational competition and ties into the idea of "skill consumption." Gibson (1998) describes skilled consumption "as an individual becomes more skillful at a leisure pursuit the individual will require more challenging experiences to reach the same level of stimulation that was experienced as a more novice participant." Without further stimulation, the participant

would become bored activity (Gibson 1998). The participation in the tournament may add additional stimulation to the grouse hunting experience, especially combined with the social aspects of the tournament.

It was hardly surprising that we saw the great strength of social factors among the motivations to hunt in a tournament, as this is common in recreation motivations research (Walker et al. 2001, Larson et al. 2014). Our respondents indicated that hunt with friends, to relax with friends, to meet people, and to be part of a tradition all important reasons to participate in the Sharptail Tournament. Further, there was also relatively little variation in those responses. The social aspect has been indicated as a strongly motivating factor in the participation in many activities. For example, saltwater tournament anglers displayed similar patterns indicating an importance for relaxation and companionship (Falk et al. 1989). Among motivations to participate in golf tournament, the tournament participants ranked social factors high (Petrick et al. 2001, Kim and Ritchie 2012). Even in non-team settings, individuals often rate the social or companionship aspect of attending a tournament high (Salazar et al. 2011). The strength of social factors has been shown in many non-tournament hunting motivations (Purdy and Decker 1986, Woods and Kerr 2010). The importance of the social component would be expected to be higher in upland game, as this type of hunting often involve multiple individuals in a hunting party. For example, grouse hunters in Norway rated being social among the highest factors influencing satisfaction with the hunt (Wam et al. 2013). Given a strong motivation of hunting in tournaments matches motivations to participate in upland game hunting, suggests that hunting tournaments may have a large potential to engage hunters

and pass along the social benefits and camaraderie that are fundamental to the hunting experience (Schulz et al. 2003).

There are many reasons that individuals may travel for sport other than social motivations, including: physical motivations, cultural motivations, and status or prestige motivators (Goeldner and Ritchie 2007). Tournament anglers were motivated by the sport and challenge (i.e. catch-related motivations) of a fishing tournament over relaxation and companionship (Falk et al. 1989). Our respondents indicated to compete against teammates, compete against other teams, obtaining bag limits, trap shoot competition, display skills, and the challenge that grouse hunting provides all less than a mean of three, indicating these attributes were less than "moderately important." Participants rated obtaining their bag limit lower compared to other motivations, even though filling the bag ultimately decides who wins the tournament. However, the low motivation to fill a bag has been observed in non-tournament grouse hunting contexts. In Norway, more grouse hunters are seeking the thrill of the experience over obtaining their bag limit (Wam et al. 2013). Thus, the low motivation to fill a bag may come from outside the tournament context, as hunters are often satisfied even if they do not harvest an animal or obtain their bag limit (Vaske et al. 1986, Hayslette et al. 2001). The greatest value among the competition motivation (i.e., to compete with teammates; mean = 3.03) likely ties more to comradery than pure competition. The influence of the social motivations for this tournament may set the context to how competition is viewed by participants. People respond differently to specific sports activities, influenced by the situations and contexts of the experience (Kurtzman and Zauhar 2005). The "aggressive" sports tourist may seek high-level competition, whereas the "affiliative" sports traveler values the pleasant, social

sport settings (Fridgen 1991). However, there was considerably more variation among respondents in these responses as compared to the social components, indicating that there were varying views on the completion aspects.

A greater understanding of hunting tournaments is needed in order to resolve any potential conflicts and competing desires among stakeholders (Wilde et al. 1998). The need for conflict resolution and prevention is of particular importance because of tournament-induced mortality of game, which separates hunting from other outdoor recreation (Cahoone 2009). Among the general hunter population and the general public may have differing views on whether hunting for competition is an acceptable use of game (Organ et al. 2012). Tournament hunting may have the potential to push the limits of the legitimate use policy because the killing of a large number of game or the largest game for the purpose of winning a contest may not be viewed as a valid purpose; even if complying with state harvest regulations and game is consumed or donated. If hunting tournaments were grow in number or embraced as a tool by management agencies, further research into attitudes of hunting tournaments among hunters and the non-hunter public will be needed.

It is beneficial to understand the limitations of this research before planning for future endeavors. First, the Sharptail Shootout hunting tournament survey consisted of a relatively small number of hunters. Most respondents were from out of state, which may have skewed motivations to lean towards being with friends and shifted the event from being viewed as competition to sports tourism. Secondly, this tournament focused on Sharptail grouse and Prairie Chickens and thus motivations of other types of game should be conducted to better understand the generalizability of our results. Furthermore, we

saw that many individuals have participated multiple years in the tournament, which may contribute to their knowledge and skillset being more advanced than typical tournament participants. Ideally, long-term survey research would allow us to take a better look into tournament participants, by collecting more data, larger sample sizes, and examining different game.

Management Implications

Engaging hunters, particularly new recruits and those that have been participating for a while, will build a greater sense of community, effective R3 efforts, and ultimately continued participation. Our research indicating the role of the social context is important, tournaments may be a tool to recruit and retain hunters. It is important to consider researching hunters who participate in tournaments in order to better understand what recreationists want drives individuals to participate in an activity. By understanding motivations of hunters that participate in hunting tournaments, management agencies and NGOs can create better experiences that are tailored to what a hunter wants and to enable more effective messaging (Ryan and Shaw 2011). Having management agencies and NGOs host, or be sponsors of, hunting tournaments on unique landscapes for unique species may be a way to provide a challenge to waning hunters. A tournament may be a way for experienced hunters to really test their skills while gathering with friends and encourage hunters to travel to events in small communities.

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Table 4-1: Confirmatory Factor Analysis of tournament hunting motivations for grouse hunters at the Sharptail Shootout.

Factor Items	Cronbach's Alpha	AVE	Omega	Factor Loadings
Scenery	0.77	0.66	0.79	
To be outdoors				0.42
To enjoy nature				0.64
Social	0.64	0.32	0.64	
To hunt with friends				0.38
To relax with friends				0.52
To meet new people				0.53
To be a part of tradition				0.67
Competition	0.78	0.46	0.81	
To compete against your teammates				1.15
To compete against other teams				1.00
To obtain your bag limit				0.63
For the competition of the trap shoot				0.83
For the opportunity to show off my skills				0.58
For the challenge grouse provide				0.26
Hunting	0.86	0.77	0.90	
For the opportunity to hunt Sharptail Grouse				0.73
For the opportunity to hunt Prairie Chicken				1.02
For the opportunity to hunt in great habitat				0.45

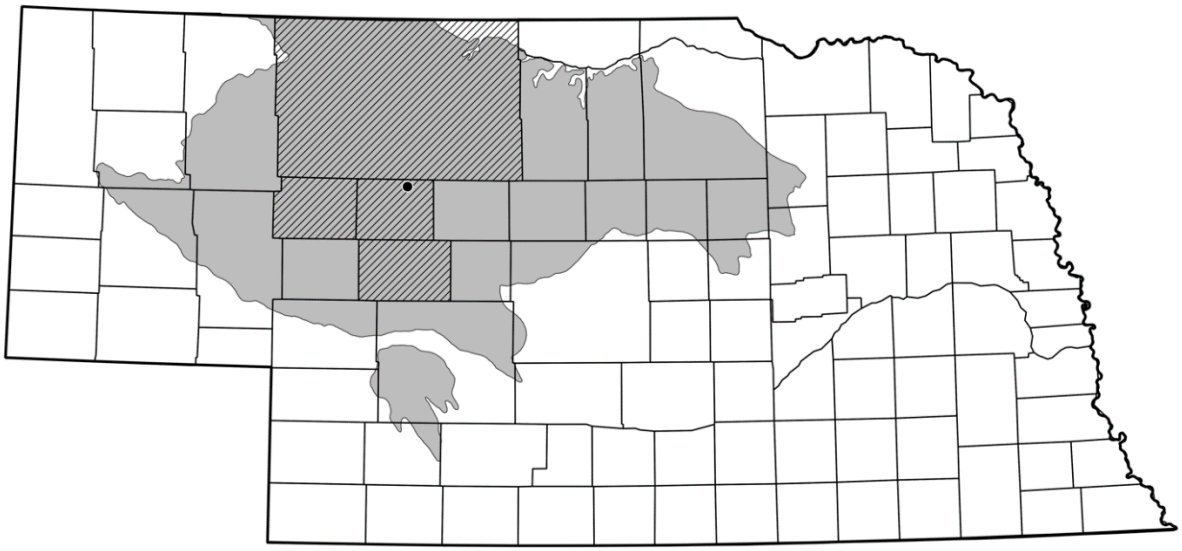
Table 4-2: Motivations to participate in the Sharptail Shootout with mean score and standard deviation.

Motivation	Mean	Standard Deviation
Hunt with friends	4.60	0.60
Be outdoors	4.57	0.61
Enjoy nature	4.38	0.75
Hunt in great habitat	4.25	0.79
Relax with friends	4.12	0.96
Opportunity to hunt Sharptail Grouse	4.00	0.84
Opportunity to hunt Prairie Chicken	3.87	1.01
Relax with family	3.64	1.27
For the challenge	3.57	0.93
For tradition	3.56	1.15
For solitude	3.52	1.21
To meet new people	3.46	1.04
Compete against teammates	3.03	1.29
Compete against other teams	2.97	1.28
For the trap shoot competition	2.52	1.39
For the accommodations	2.51	1.35
To obtain bag limit	1.93	1.13
To show off skills	1.83	1.12

Table 4-3: Motivations for using a dog to hunt in a tournament with mean score and standard deviation.

Motivation	Mean	Standard Deviation
For the enjoyment	4.61	0.74
To watch the dog work	4.49	0.72
To increase chances of finding birds	4.48	0.67
To have a hunting companion	4.41	0.86
To be a part of tradition	3.93	1.17

Figure 4-1. Location of the Sharptail Shootout. Counties in cross hatch are the locations of the hunt and the dot is Mullen, Nebraska. The grey fill indicates the Sandhills ecoregion.



Appendix A. Email Invitation

Code:

DATE

Dear (First name Last Name),

SCHOOL OF NATURAL RESOURCES

You have been selected as an individual who has purchased a hunting permit during the past eight years to provide a perspective on your hunting experience. This study is being conducted by the University of Nebraska—Lincoln to learn about how people hunt, why people hunt certain species, and what may hinder individuals from hunting in Nebraska. The results of this survey will help us better understand hunting experiences in Nebraska. Participation in this study will require approximately 15 minutes and the survey will remain open until 11/17/2017. If you are 19 years of age or older, you may participate in this research. You are free to decline to participate in this study. To access this web survey through Snap Surveys, please follow this link and enter YOUR FULL EMAIL ADDRESS (the email address that received this message in all lower-case) to log in.

If you do not wish to participate in this survey, check "No" to the first question in the online survey and click submit. To view Snap Survey privacy policy, enter www.snapsurveys.com/survey-software/privacy-policy-us into your internet web browser. You may also withdraw at any time without harming your relationship with the researchers of the University of Nebraska-Lincoln or the Nebraska Game and Parks Commission. There are no known direct risks or benefits to your participation. All data will be kept confidential and respondents will remain anonymous. Results will be reported in aggregate and presented at conferences and published in peer-reviewed scientific journals. You may ask any questions concerning this research at any time by contacting Alisha Grams (email: alisha.grams@huskers.unl.edu) or Dr. Christopher Chizinski (email: cchizinski2@unl.edu). If you would like to speak to someone else, please call the Research Compliance Services Office at 402-472-6965 or irb@unl.edu.

Sincerely,

Alisha Grams

School of Natural Resources – Graduate Research Assistant

Appendix B. Motivation and Constraint Survey

Please enter the **ENTIRE** email address with which you received the invitation. **USE ALL LOWER CASE**

The University of Nebraska – Lincoln is interested in learning about your preferences, motivations, specializations, and barriers in regard to hunting. The results of this study will serve to better understand hunting opportunities and will assist in the management of multiple game species. If you do not wish to participate in this questionnaire mark "No" to the first question and click "submit" at the bottom of the last questionnaire page. No identifying information will be associated with your responses, and responses will be reported in aggregate with responses from all other hunters.

Do you wish to participate in this survey?

- ◯ Yes
- ◯ No

Section 1: Hunting Experience

Which statement best describes you as a hunter?

- ◯ I have gone hunting but do not consider myself a
- ◯ hunter. I am in the process of becoming a hunter.
- ◯ I consider myself a hunter.
- ◯ I used to consider myself a hunter but no longer do.

Between 2010-2016, how many years have you participated in hunting the following game species?

	0	1	2-3	4-6	7 (every year)
Deer (Mule, Whitetail)	◯	◯	◯	◯	◯
Pheasant/Quail	◯	◯	◯	◯	◯
Turkey	◯	◯	◯	◯	◯
Grouse	◯	◯	◯	◯	◯
Rabbit/Squirrel	◯	◯	◯	◯	◯
Waterfowl (Duck, Goose)	◯	◯	◯	◯	◯

At what age did you start hunting? **USE ONLY NUMBERS**

[ ]

What was the last year you hunted? **USE FOUR DIGITS**

[ ]

How many years have you hunted in **NEBRASKA? USE ONLY NUMBERS**

[ ]

Which of the following **NEBRASKA** permits have you bought since 2010? **SELECT ALL THAT APPLY.**

- ☐ Big Game (Deer, Turkey, Elk, or Antelope)
- ☐ Small Game (Pheasant, Quail, Rabbit, Squirrel)
- ☐ Waterfowl (Duck, Goose)

Have you hunted **OUTSIDE** of **NEBRASKA** in the **past 5 years**?

- ◯ Yes
- ◯ No

What game species did you hunt **OUTSIDE** of **NEBRASKA**? **SELECT ALL THAT APPLY**

- [ ] Deer (Mule, Whitetail)
- [ ] Turkey
- [ ] Pheasant/Quail
- [ ] Grouse
- [ ] Rabbit/Squirrel
- [ ] Waterfowl (Duck, Goose)
- [ ] Other

If other, what game species do you hunt **OUTSIDE** of Nebraska

The following section contains 7 species sets each with different combinations of species. This section provides us with information about species preferences. **ONLY CHOOSE 1 LEAST PREFERRED AND 1 MOST PREFERRED ANSWER** for each species set. It is important that you complete ALL 7 SPECIES SETS.

EXAMPLE. If you were given a choice of four different fruit, banana is your least preferred and kiwi is your most preferred.

Species Set (1):

	Least Preferred	Most Preferred
Pheasant	○	○
Waterfowl (Duck, Goose)	○	○
Deer (Mule, Whitetail)	○	○
Quail	○	○

Species Set (2):

	Least Preferred	Most Preferred
Pheasant	○	○
Rabbit/Squirrel	○	○
Waterfowl (Duck, Goose)	○	○
Grouse (Sharptail, Prairie Chicken)	○	○

Species Set (3):

	Least Preferred	Most Preferred
Turkey	○	○
Waterfowl (Duck, Goose)	○	○
Grouse (Sharptail, Prairie Chicken)	○	○
Quail	○	○

Species Set (4):

	Least Preferred	Most Preferred
Rabbit/Squirrel	○	○
Turkey	○	○
Waterfowl (Duck, Goose)	○	○
Deer (Mule, Whitetail)	○	○

Species Set (5):

	Least Preferred	Most Preferred
Rabbit/Squirrel	○	○
Deer (Mule, Whitetail)	○	○
Grouse (Sharptail, Prairie Chicken)	○	○
Quail	○	○

Species Set (6):

	Least Preferred	Most Preferred
Pheasant	○	○
Rabbit/Squirrel	○	○
Turkey	○	○
Quail	○	○

Species Set (7):

	Least Preferred	Most Preferred
Pheasant	○	○
Turkey	○	○
Deer (Mule, Whitetail)	○	○
Grouse (Sharptail, Prairie Chicken)	○	○

If you could only hunt **ONE** species in **NEBRASKA,** what would it be?

[ ]

What type of hunting do you most prefer in **Nebraska**?

- ◯ Big Game
- ◯ Small Game
- ◯ Waterfowl
- ◯ Turkey
- ◯ None of the above

Section 2: Reasons for Hunting **{Q19}**

On a 5-point scale, indicate the importance of each of the following reasons for you to go hunting.

	Not Important	Slightly Important	Moderately Important	Important	Very Important
Spending time outdoors/experiencing nature	◯	◯	◯	◯	◯
Spending time with family or friends	◯	◯	◯	◯	◯
Harvesting a trophy animal	◯	◯	◯	◯	◯
Obtaining my bag limit/filling my tag	◯	◯	◯	◯	◯
Providing meat for myself, family, or friends	◯	◯	◯	◯	◯
Managing game populations	◯	◯	◯	◯	◯
Enjoying solitude	◯	◯	◯	◯	◯
Hunting for the challenge	◯	◯	◯	◯	◯
Opportunity to get a shot at an animal	◯	◯	◯	◯	◯
Outwitting difficult-to-hunt species	◯	◯	◯	◯	◯
Observing game species	◯	◯	◯	◯	◯

Section 3: General Hunter Characteristics

Do you typically use a dog to hunt the following species:

	I do not hunt this	No	Yes
Duck	○	○	○
Goose	○	○	○
Grouse	○	○	○
Pheasant	○	○	○
Quail	○	○	○
Rabbit	○	○	○
Squirrel	○	○	○

Do you belong to any local, state, or national hunter organizations?

- ○ Yes
- ○ No

Which of the following local, state, or national hunter organizations do you belong to? Select all that apply.

- ☐ Pheasants Forever
- ☐ National Wild Turkey Federation
- ☐ Ducks Unlimited
- ☐ Boone and Crockett Club
- ☐ National Rifle Association
- ☐ Whitetails Unlimited
- ☐ Ruffed Grouse Society
- ☐ Quail Unlimited
- ☐ Mule Deer Foundation
- ☐ Quality Deer Management Association
- ☐ Nebraska Bow Hunters Association
- ☐ Other

If you chose "other" for hunter organizations in the previous question, please list the hunter organizations you are affiliated with.

The following questions pertain to **{Q19} HUNTING.**

Approximately, what is the total number of days you spend hunting in a typical year? **USE ONLY NUMBERS**

When you go hunting, what is the typical party size (i.e. how many people you hunt with) **INCLUDING YOURSELF**? **USE ONLY NUMBERS**

Primarily, where do you hunt in **Nebraska**?

- ◯ **Private** land where permission is required
- ◯ **Private** land I own or lease
- ◯ **Public** land open to hunting
- ◯ **Both**, private and public land

On average, about how many miles do you travel **(ROUND-TRIP)** to get to your hunting spot in **Nebraska**? **USE ONLY NUMBERS**

[ ]

During an average hunting trip, about how many hours per day do you spend in the field hunting in **Nebraska**? **USE ONLY NUMBERS**

[ ]

How strongly do you agree or disagree with each of the following statements?

Centrality to Life:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
If I stopped hunting, an important part of my life would be missing.	◯	◯	◯	◯	◯
Hunting is an annual tradition that has become important to me.	◯	◯	◯	◯	◯
Participation in hunting is a large part of my life.	◯	◯	◯	◯	◯
Given the effort I have put into hunting, it would be difficult to find a replacement activity.	◯	◯	◯	◯	◯
I plan vacation time around hunting seasons.	◯	◯	◯	◯	◯
I spend a lot of time before the season scouting the area in which I will hunt.	◯	◯	◯	◯	◯

Skills/Knowledge:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Given the hunting skills/knowledge I have developed, it is important I continue to hunt.	◯	◯	◯	◯	◯
Testing/improving my hunting skills is more important than harvesting an animal.	◯	◯	◯	◯	◯
I would describe my skill level in hunting as advanced or expert.	◯	◯	◯	◯	◯
It takes a great deal of skill to become a successful hunter.	◯	◯	◯	◯	◯

Equipment:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I own enough equipment to be successful.	○	○	○	○	○
I have access to hunting equipment owned by others.	○	○	○	○	○
I could be more successful if I owned better/more equipment.	○	○	○	○	○
I have invested a lot of money in hunting equipment.	○	○	○	○	○

Self-Expression:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
When I am hunting, others see me the way I want them to see me.	○	○	○	○	○
You can tell a lot about a person when you see them hunting.	○	○	○	○	○
When I am hunting I can really be myself.	○	○	○	○	○

Section 4: Nebraska **{Q19}** Hunting

How limiting are each of the following statements regarding your opportunity to hunt **{Q19}** in **NEBRASKA?**

	Not at all Limiting	Slightly Limiting	Moderately Limiting	Limiting	Very Limiting
Finding land to hunt	○	○	○	○	○
Season dates	○	○	○	○	○
Bag limits/tags	○	○	○	○	○
Hunting opportunities near my home	○	○	○	○	○
Populations of game	○	○	○	○	○
Crowding at my hunting areas	○	○	○	○	○
Finding game	○	○	○	○	○
Terrain I hunt in	○	○	○	○	○

How limiting are each of the following statements regarding your skills/interests to hunt **{Q19}** in **NEBRASKA?**

	Not at all Limiting	Slightly Limiting	Moderately Limiting	Limiting	Very Limiting
My availability of hunting partners	○	○	○	○	○
My hunting skills	○	○	○	○	○
My interest in other recreational activities	○	○	○	○	○
My interest in eating wild game	○	○	○	○	○

How limiting are each of the following statements regarding commitments/cost to hunt **{Q19}** in **NEBRASKA?**

	Not at all Limiting	Slightly Limiting	Moderately Limiting	Limiting	Very Limiting
Personal commitments	○	○	○	○	○
Personal or family health issues	○	○	○	○	○
Cost of the permit	○	○	○	○	○
Travel costs (gas and lodging)	○	○	○	○	○
Cost of the equipment necessary to hunt	○	○	○	○	○
Cost to process game meat	○	○	○	○	○

How would you rate the taste of the following game species?

	Never Tried	Strongly Dislike	Dislike	Neutral	Enjoy	Strongly Enjoy
Deer (Mule, Whitetail)	○	○	○	○	○	○
Turkey	○	○	○	○	○	○
Pheasant	○	○	○	○	○	○
Quail	○	○	○	○	○	○
Grouse (Sharptail, Prairie Chicken)	○	○	○	○	○	○
Rabbit	○	○	○	○	○	○
Waterfowl (Duck, Goose)	○	○	○	○	○	○

How difficult do you feel it would be to hunt the following species in **NEBRASKA** if you hav **NEVER ATTEMPTED** before?

	I have hunted this species	Very Easy	Easy	Neutral	Difficult	Very Difficult
Deer (Mule, Whitetail)	○	○	○	○	○	○
Turkey	○	○	○	○	○	○
Pheasant	○	○	○	○	○	○
Quail	○	○	○	○	○	○
Grouse (Sharptail, Prairie Chicken)	○	○	○	○	○	○
Rabbit	○	○	○	○	○	○
Waterfowl (Duck, Goose)	○	○	○	○	○	○

Has anyone ever served as a hunting mentor to you?

○ Yes
○ No

Who was your hunting mentor? **SELECT ALL THAT APPLY.**

☐ Professional Guide
☐ Agency Personnel
☐ Co-worker
☐ Hunter Education Instructor
☐ Friend
☐ Family Member
☐ Other

If you chose "other" for your hunting mentor, indicate that mentors relationship to you.

Which family member(s) were your mentor? **SELECT ALL THAT APPLY.**

- [ ] Grandfather
- [ ] Grandmother
- [ ] Father
- [ ] Mother
- [ ] Aunt
- [ ] Uncle
- [ ] Sibling
- [ ] Cousin
- [ ] In-Law
- [ ] Other

If you chose "other" for your hunting mentor, indicate that mentors relationship to you.

Do you currently mentor anyone who is trying to become a hunter or improve their hunting skills?

- ○ Yes
- ○ No

As a hunter, would you be willing to serve as a mentor to someone who is interested in learning to hunt? (Advice, hunting, practice)

- ○ Yes
- ○ No

Who would you be willing to mentor? **SELECT ALL THAT APPLY.**

- [ ] Family Member
- [ ] Friend
- [ ] Youth or child I know
- [ ] Any youth or child
- [ ] Co-worker
- [ ] Someone I don't know

What type of mentoring would you be willing to do? **SELECT ALL THAT APPLY.**

- [ ] Take hunting
- [ ] Provide hunting advice
- [ ] Demonstrate how to use equipment
- [ ] Process an animal
- [ ] Lend hunting equipment
- [ ] Other

If you chose "other" for mentoring type, indicate what other mentoring you would be willing to do.

Section 5: Demographics

Year of birth **FOUR DIGITS**

Zipcode of primary residence **FIVE DIGITS**

Gender

- ◯ Male
- ◯ Female
- ◯ I prefer not to answer

Approximate total household income before taxes in 2016

- ◯ Under $20,000
- ◯ $20,000-$39,999
- ◯ $40,000-$59,999
- ◯ $60,000-$79,999
- ◯ $80,000-$99,999
- ◯ $100,000 or more
- ◯ I prefer not to answer

Highest level of education you have completed

--Click Here--

- Some High School
- High School/Vocational School/GED
- Some College
- Associates Degree
- Bachelors Degree
- Graduate Degree
- I prefer not to answer

Comments:

Thank you for your time and assistance. Your input is valued and will help mangers to gain a better understanding of hunters and their experiences in Nebraska.

Appendix C. Email Reminder

FishHunt.unl.edu

Code:

DATE

Dear (First name Last Name),

You have been selected as an individual who has purchased a hunting permit during the past eight years to provide a perspective on your hunting experience. We recently emailed you an invitation to a web survey regarding your perspective on hunting in Nebraska and have not received your completed survey. The information you and other selected hunters is vital in allowing management agencies to understand to learn about how people hunt, why people hunt certain species, and what may hinder individuals from hunting in Nebraska. Please take 15 minutes to complete the questionnaire. If you have not finished the web survey, please do so by 11/17/2017. Email information entered at the login is used only for our purposes of identifying who has taken the survey and who has not and ensures that we do not contact you again with reminders. No information is shared with the SNAP software company.

To access this web survey, please follow this link and enter this code [CODE] to gain access. To view the Snap Surveys privacy policy please visit www.snapsurveys.com/survey-software/privacy-policy-us. You are free to decide to participate in this study. You can also withdraw at any time without harming your relationship with the researchers or the University of Nebraska-Lincoln or the Nebraska Game and Parks Commission. There are no known direct risks or benefits to your participation. All data will be kept confidential and respondents will remain anonymous. Results will be reported in aggregate and presented at conferences and published in peer-reviewed scientific journals. You may ask questions concerning this research at any time by contacting Alisha Grams (email: alisha.grams@huskers.unl.edu) or Christopher Chizinski (email: cchizinski2@unl.edu). If you would like to speak to someone else, please call the Research Compliance Services Office at 402-472-6965 or irb@unl.edu.

Thank you for helping with this important study.

Sincerely,

Alisha Grams

School of Natural Resources – Graduate Research Assistant

Appendix D. Sharptail Shootout Survey

My name is Alisha Grams and I am a graduate student at the University of Nebraska—Lincoln, pursuing my master's degree in natural resources. My thesis research involves studying hunting preferences, why people are motivated to go hunting and identifying barriers to hunting. The main focus of the research is to explore reasons why grouse and small game hunting participation has been decreasing in Nebraska.
The Sharptail Shootout provides a unique opportunity to assess a group of individuals who participate in grouse hunting and compete in a hunting-related tournament. I am conducting this survey to determine what motivates people to grouse hunt in a tournament setting, and learn a little about mentorship of hunters. I plan to use this in my thesis to compare some of the motivations of the tournament hunters with the motivations from my larger survey of small game hunters.

The survey can be completed as an interview or taken and returned to me on the hunters own time. Questions I ask will help measure a person's motivations for hunting in a tournament, mentorship, and demographics. I will ask some standard demographic questions. This will gain some basic information about who is participating in the Shootout. I also ask for participants' zip codes which allows calculation of approximate travel distance. Participants can choose to not participate in the entire survey, or participants may choose to not answer specific questions. All participants in the survey will remain anonymous and no individually identifying information will be recorded. All results will be reported in groups or as means or totals.
Thank you again for this opportunity. It is truly a unique experience for me to gain some valuable information about this segment of hunters. I am more than happy to provide you a write up of the results from this survey.

Hunting Information

Q1 How many years have you participated in hunting of any kind?

Q2 How many years have you participated in grouse hunting?

Q3 During an average hunting season, what game species do you hunt? **(LIST ALL)**

1
2
3
4
5
6

The Sharptail Shootout

Q4 Rate the following statements on a scale of 1 to 5, with **1 being not important at all and 5 being very important** in regard to your motivations for participating in the Sharptail Shootout.

	Not Important	Slightly Important	Moderately Important	Important	Very Important
To spend time outdoors	○	○	○	○	○
To experience nature	○	○	○	○	○
To spend time hunting with family	○	○	○	○	○
To spend time hunting with friends	○	○	○	○	○
To enjoy solitude	○	○	○	○	○
To spend relaxation time with family	○	○	○	○	○
To spend relaxation time with friends	○	○	○	○	○
To compete between other teams	○	○	○	○	○
To compete with my teammates	○	○	○	○	○
For the challenge grouse provide	○	○	○	○	○
To obtain my bag limit	○	○	○	○	○
To meet new people	○	○	○	○	○
To be a part of tradition	○	○	○	○	○
For the quality of lodging and meal accommodations	○	○	○	○	○
For the opportunity to show off my skills	○	○	○	○	○
For the competition of the trap shoot	○	○	○	○	○
For the opportunity to hunt Sharptail grouse	○	○	○	○	○
For the opportunity to hunt Prairie Chicken	○	○	○	○	○
For the opportunity to hunt in great habitat	○	○	○	○	○

Q5 Is the Sharptail Shootout the only time you pursue grouse?

- ◯ Yes
- ◯ No

Q6 Do you compete in other competitive recreational activities? (ex. fishing tournaments, archery shoots)

- ◯ Yes
- ◯ No

Q7 How many years have you participated in the Sharptail Shootout?

Q8 Has your team from this year participated in the sharptail shootout event before?

- ◯ Yes
- ◯ No

Q9 What is your relationship with all of the other teammates? **(LIST ALL)**

1
2
3
4

Q10 Did you bring a guest?

- ◯ Yes
- ◯ No

Mentorship

Q11 Has anyone ever served as a **grouse** hunting mentor to you?

- ◯ Yes
- ◯ No

Q12 **IF YES**, what was your mentors relationship to you? **(CHECK ALL THAT APPLY)**

- ☐ Guide
- ☐ Family Member
- ☐ Colleague
- ☐ Other
- ☐ Friend

Q13 Have you ever served as a **grouse** hunting mentor to anyone?

- ◯ Yes
- ◯ No

Q14 **IF YES**, who have you served as a mentor? **(CHECK ALL THAT APPLY)**

- ☐ Guide
- ☐ Family Member
- ☐ Colleague
- ☐ Other
- ☐ Friend

Dogs

Q15 Do you plan to use a dog during the competition?

- ◯ Yes
- ◯ No

Q16 **IF YES**, what breed of dog will you use? **(LIST ALL)**

Q17 **IF YES**, rate the following statements on a scale of 1 to 5, with **1 being not important at all and 5 being very important** in regard to your motivations for using a dog to hunt.

	Not Important	Slightly Important	Moderately Important	Important	Very Important
To watch the dog work	◯	◯	◯	◯	◯
To have a dog as a hunting companion	◯	◯	◯	◯	◯
To be a part of a tradition of using a dog to hunt	◯	◯	◯	◯	◯
To increase my ability to find birds	◯	◯	◯	◯	◯
To add to the enjoyment of hunting	◯	◯	◯	◯	◯

Demographics

Q18 What year were you born? (ex. 1985 - use 4 digits)

Q19 What is the zip code of your primary residence?

Q20 What is your gender?

- ○ Male
- ○ Female
- ○ I prefer not to answer

Q21 Comments Box:

Thank you for taking time to complete this survey.

Appendix E. Supplemental for Chapter 4

Methods

On May 8, 2018, we conducted a search to find peer-reviewed literature and conference proceedings using Web of Science (https://clarivate.com/products/web-of-science/) during 1980 to 2018. For fishing, we searched "tournament" in title and "fishing" as a topic and for hunting we searched "tournament" in the title and "hunting" as a topic. The abstracts were broken apart into individual words using the tidytext package (Silge and Robinson 2016) in R (R Core Team 2018). Individual words were singularized and stop words removed.

Results

The search revealed 71 relevant manuscripts for the fishing search and 0 for the hunting search. The five most frequent words were: mortality, bass, largemouth, release, and angler (Figure E-1). Mortality and release are indications that a lot of research focuses on the survival of tournament post-caught fish. Largemouth bass *Micropterus salmoides* are an important tournament species.

References

R Core Team. 2018. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.

Silge, J., and D. Robinson. 2016. tidytext: Text Mining and Analysis Using Tidy Data Principles in R. JOSS 1. <http://dx.doi.org/10.21105/joss.00037>.

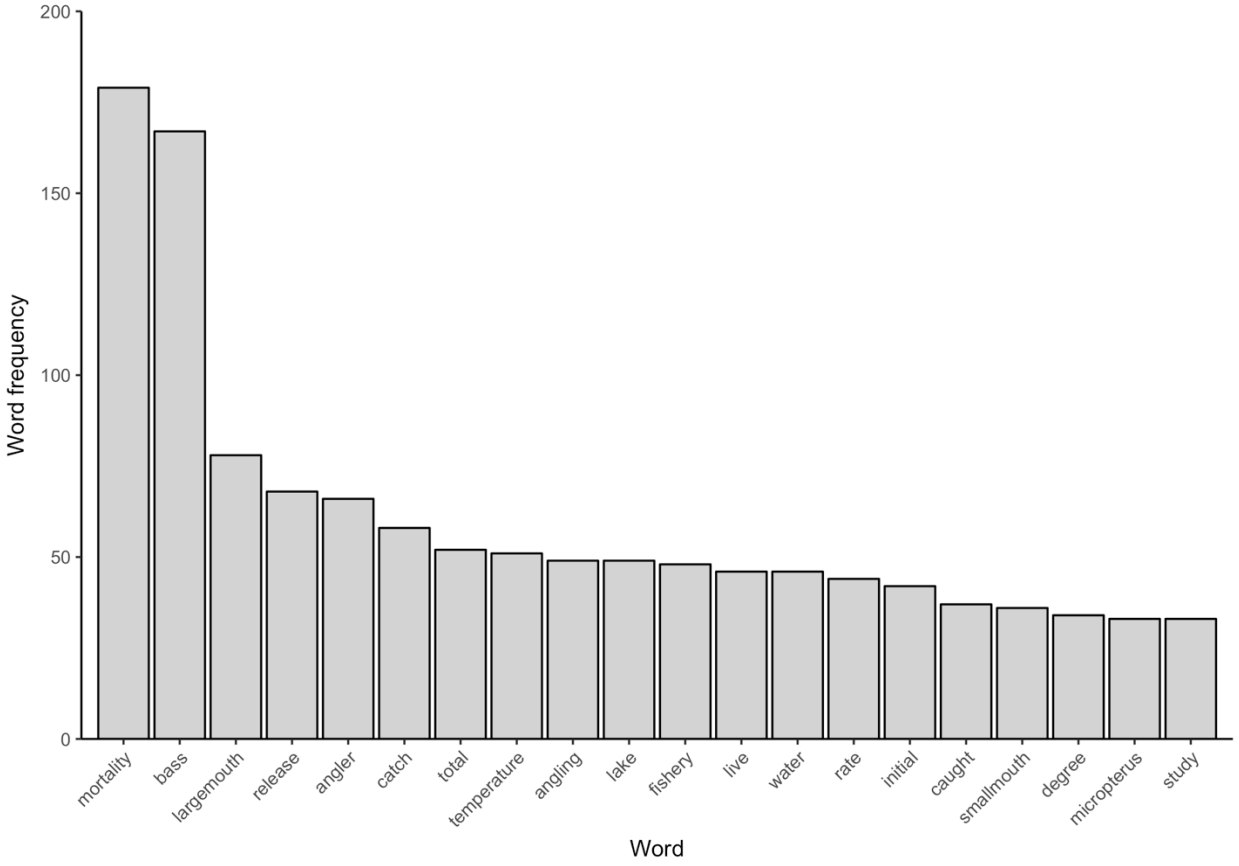


Figure E-1. Word count of the top 20 words in abstracts of manuscripts and conference proceedings about fishing tournaments. Words are arranged from most frequent (left) to least frequent (right).